**Supplemental Material**

Concept of Operations Plan (CONOPS) Template:

**Conducting Disaster Research Response (DR2) to Support Public Health Practice**

**A Concept of Operations Plan (CONOPS) Template**

**Introduction**

Research conducted in the context of a disaster or public health emergency is essential to improve knowledge about its short- and long-term health consequences, as well as the implementation and effectiveness of response and recovery strategies. Integrated approaches to conducting disaster research response (DR2) can answer scientific questions, while also providing information for preparedness, mitigation, response, and recovery-related decisions and actions undertaken by policymakers and practitioners. Moreover, data collected or analyzed as part of a DR2 may have attendant value for operational response, and vice versa.

In order to maximize the scientific and practical concomitant efforts and values of DR2, it must be planned and implemented as a collaborative effort involving both public health academics and practitioners. While essential elements to an integrated approach to DR2 have been previously identified, specific strategies for academic public health and Public Health Agencies (PHAs) are needed to guide their implementation. Further, specific approaches to addressing core DR2 challenges, including those related to research issue identification and prioritization, research process, infrastructure and implementation, and relationships, coordination, and engagement, are necessary. In response, this Concept of Operations Plan (CONOPS) identifies specific, yet adaptable and actionable, strategies for academic public health and PHAs to collaboratively plan for and implement DR2.

**Approach**

We identify and describe several strategies that can be undertaken by academic public health and PHAs to prepare for, implement and evaluate DR2. These strategies should be developed and implemented by a standing DR2 committee, and established in collaboration with academic public health, local and state PHAs, and communities within a given region. While academic public health and PHAs often engage in various partnerships and collaborative activities on an individual project or relationship basis, the committee's focus should be specifically on planning and implementing activities that support the collection and analysis of information in the context of a disaster. If possible, the committee should be co-chaired by academic public health and PHA representatives with disaster research knowledge, experience, and interests. Co-chairs should have decision-making authority or direct access to decision makers as it relates to disaster research. Academic public health and PHA leadership should be involved to ensure the committee is adequately resourced and staffed, and that there is planned administrative and staffing support in the post-event period. The committee's responsibilities include overseeing and coordinating the execution of each of the preparedness and response strategies outlined herein, as well as planning, implementing, and integrating the findings of evaluative activities. The committee should consider including a community representative to gain insight into the community’s concerns, priorities, and expertise. The committee should develop and nurture relationships across PHAs and academic public health specific to the conduct of disaster research. Since disasters occur relatively infrequently, these relationships must be honed prior to a disaster. As such, we recommend that the committee host continuous, standing, and (if possible) in-person meetings.

Strategies proposed in this CONOPS template should be customized for academic public health/PHA regional stakeholders and needs and documented in a DR2 plan that is regularly updated and reviewed by the standing committee. This plan should outline specific roles and responsibilities for groups and positions within both academic public health and PHAs, as well as triggers for plan activation. The plan should include a schedule for review and processes for updates based on findings from exercises, real-world incidents, and ongoing process evaluations.

Specific DR2 pre-event and post-event strategies are listed in Table 1, along with suggested lead or co-lead organizations. Below, we further describe each of the proposed strategies and align them with the overarching DR2 committee functions and then each of four core DR2 challenge areas (Research issue identification and prioritization; Research process; Infrastructure and implementation; and Relationships, coordination and engagement).

**0. DR2 Committee Functions**

**0.1 Develop and maintain a broad stakeholder engagement plan and relationships, inclusive of community representatives.** Robust relationships underpin the success of all activities in the CONOPS. As such, the DR2 committee should be the central body that connects and convenes diverse stakeholders as needed. In particular, the DR2 committee should consider including community representatives to gain insight into the community’s concerns, or align with an existing disaster or public health-related committee or workgroup that has engaged community representatives. Community input to guide research and response priorities is crucial to adequately meeting the needs of, as well as fostering trust with, the populations ultimately impacted by disasters. The committee should also consider inclusion of regional emergency management professionals or other disaster response group members to increase opportunities for collaboration.

**0.2 Sustain and direct activities and administrative functions of the DR2 plan as outlined below.** The DR2 committee should function as the administrative and operational body of this proposed plan. This includes creating forums for exchange and communication to enable the success of all CONOPS activities, as well establishing a process to support and manage the various activities functioning of the CONOPS convening of stakeholders, participant lists, meeting notes, tracking, communications, and other administrative functions.

**0.3 Activate DR2 management infrastructure when transitioning from the preparedness phase to the response and recovery phase during the onset of a disaster**. The DR2 committee should be the body to convene and decide when to activate response-specific plans outlined herein. This decision should be based on input from stakeholders and ultimately decided by the committee based on the context of the particular disaster.

**1. Pre-event Preparedness**

1.1 Research issue identification and prioritization

**1.1.1 Host a workshop to identify and prioritize disaster research needs, including community perspectives.** Academic public health and PHAs should co-host a workshop to identify and discuss the highest-priority research needs before and after an event. The workshop should identify scientific areas of concern related to hazards prioritized in state and local hazard mitigation plans and focus on issues that have the capacity to improve PHA operations. The workshop may be structured to identify all-hazards or hazard specific research needs, but identified needs should be specific enough to inform the development of research protocols that can be rapidly activated post-event. The workshop should prioritize needs, or groups of needs, in order to inform the committee’s ongoing activities (e.g., protocol development). Further, workshop participants should outline a plan to refine research priorities based on event specific information needs and scientific opportunities. Potential participants include state and local emergency management agencies, social service organizations, healthcare coalitions and/or organizations, community-based organizations, and other relevant government agencies.

**1.1.2 Develop processes for updating research priorities based on evolving information needs.** During an event, new findings on risks, consequences, and interventions may emerge and operational information needs may change over the course of a disaster response, resulting in changing DR2 priorities. The DR2 committee should collaboratively develop plans to recognize and address these changing information needs when a disaster takes place. These strategies may include engaging students to conduct rapid evidence reviews, frequent check-ins on PHA operational information needs, and report-outs by academic public health on the latest emerging evidence.

1.2 Research process

**1.2.1 Develop research protocols to address research priorities identified during the workshop.** Plans for the collection, analysis and interpretation of information relevant to high priority, practice-relevant research areas should be developed based on workshop outputs. The research protocols should include details about study objective, design, duration, sample, analysis, interpretation, and translation.

**1.2.2 Establish or adapt procedures to rapidly or provisionally review protocols by responsible IRBs.** IRB processes that allow for rapid review of disaster-related protocols to allow for timely research response, while upholding ethical standards, should be developed. IRBs may consider provisional approval of protocols, and/or accelerated procedures for review during an event. Moreover, procedures developed pre-event should address issues related to data and information sharing across agencies (i.e., academic public health and PHAs) so that data collected can be used and accessed for both scientific and operational response purposes. Potential solutions to be considered include establishing reliance agreements between PHA and academic public health IRBs and/or establishing a central IRB for use across organizations.

**1.2.3 Explore, identify, and/or establish funding opportunities and financial mechanisms to rapidly support post-event DR2 activities.** Possible strategies for rapidly funding DR2 include development of flexible funding pools (e.g. standing funding streams within academic public health and/or PHAs); identifying research-relevant activities that can be supported through federal emergency response funds (e.g., collection of data directly relevant to response or recovery); mechanisms or agreements for rapidly transferring funds across organizations; writing DR2-related objectives into grant aims to facilitate administrative supplements; supporting DR2 pilot grants through funded research centers; and working with university donor, corporate or alumni relations to pre-identify donors, funders and/or establish plans for gift campaigns. Grant proposals that support preparedness and response research involving academic public health and PHAs (e.g. reinvisioned Preparedness and Emergency Response Research Centers (PERRCs)) should be prioritized, including through institutional grant writing support.

**1.2.4 Identify funding or IRB reporting requirements and establish plans, tools, or templates to collect relevant information in the context of the DR2.** Reporting requirements for likely funders as well as IRB(s) overseeing research should be compiled, which should be used to develop plans, tools, and templates in advance, in order to rapidly collect required data in requisite format.

**1.2.5 Pre-establish an administrative clearance or credentialing process to allow researchers site access for data collection.** Site access is especially important for the collection of perishable data by researchers in the immediate aftermath of an acute disaster. These sites may be hospitals or areas affected by the hazard. However, site access may be limited by authorities or organizations for a number of reasons, including safety and to minimize burden to affected individuals and communities. Clearance processes to grant researchers access to sites for DR2 data collection activities should be established. These processes should consider researcher and affected individual/community safety, establish criteria for access, establish a process for determining access post-event, develop “passports” for entry (e.g., access cards), and train researchers, authorities, and/or gatekeepers on processes and passport recognition.

1.3 Infrastructure & implementation

**1.3.1 Train students, faculty, and staff on DR2.** Academic public health programs should provide training for students, faculty, and staff on DR2-relevant topics, including the Incident Command System (ICS), disaster research ethics, safety, protocol development, and community engagement. Training developed should include graduate coursework, continuing professional education, and just-in-time modules. This training may be jointly offered with PHAs (*see 1.3.2*).

**1.3.2 Train PHA personnel on DR2.** PHAs should provide training for personnel on DR2-relevant topics, including disaster research ethics, safety, protocol development, and community engagement. This training may also include providing community scientists with relevant training if they are involved in data collection or implementation of research. Training may be jointly offered with academic public health (*see 1.3.1*).

**1.3.3 Assess DR2 plans through joint exercises.** Joint tabletop/discussion-based exercises should be conducted collaboratively with academic public health and PHAs to assess plans developed for DR2. Further, DR2-related objectives should be integrated into PHA- or jurisdictionally hosted exercises, and academic public health representatives should participate. Strengths and areas for improvement identified through the exercise should be documented, and a corresponding improvement plan should be developed to identify and inform implementation of specific recommendations and DR2 plan updates.

**1.3.4 Develop processes for post-event evaluation and DR2 plan improvement.** Plans and protocols should be developed to document strengths and areas for improvement and/or answer specific evaluation questions, as well as a corresponding improvement plan to identify and inform implementation of specific recommendations and DR2 plan updates. DR2-specific issues may be incorporated into regional or agency-specific after-action reports (AARs) or evaluations. The DR2 committee may also make plans to host independent evaluative activities, including DR2-specific AARs.

1.4 Relationships, coordination, and engagement

**1.4.1 Integrate a DR2 liaison into plans for response and recovery management.**  A position responsible for DR2 should be integrated into incident command systems or management structures. The goal of this position is to support integration of DR2 with response and recovery operations, ensure that it does not impede response or recovery operations, and ensure continuous dialogue between researchers and practitioners. For example, a “science liaison officer” could report directly to command staff, or a research branch could be established within the operations section. This position should be staffed by a professional with event-relevant scientific knowledge and skills, relationships and connections, and decision-making authority within the PHA and academic public health.

**1.4.2 Establish DR2 MOUs, data sharing agreements, and/or charters.** Flexible MOUs, data sharing agreements, and/or charters formally establishing and outlining collaborative DR2 activities should be established. For example, data sharing agreements should be created during the preparedness stage to avoid data access complications during the research response. Such agreements should be adaptable to meet disaster-specific needs, and outline roles, responsibilities, and tasks to be completed by each party.

**1.4.3 Create opportunities for academic public health and PHA staff to work within and across organizations.** Joint appointments for academic public health faculty and PHA staff can be established to facilitate joint pre-event DR2 activities and minimize administrative burdens for cross-organizational collaboration during response and recovery.

**1.4.4 Develop tools for research translation.** Tools for translating research findings into response and recovery decision-making, including research brief templates or guidelines for short policy-focused presentations, should be identified and developed by academic public health and PHAs. When sharing research results with PHA partners using these templates, researchers should consider the practical, policy, and communication considerations that are important from the practitioner perspective specifically. These tools should include considerations for communicating preliminary or inconclusive research findings.

**1.4.5 Create a roster of subject matter experts that can advise on DR2.** A comprehensive roster of subject matter experts (SMEs) should be collaboratively compiled by academic public health and PHAs with both research and practice-based technical expertise. SMEs may be called on to advise the DR2 committee or research teams on event-specific DR2 issues, including those related to hazards, routes of exposure, community engagement, research ethics, and/or study design. Prospective SMEs should be contacted to assess their interest and willingness to participate in DR2 activities. The roster should be updated at least annually by the DR2 committee.

**1.4.6 Establish research, hazard, and community-specific engagements and associated plans with diverse stakeholders, including community representatives.**The DR2 committee should identify and maintain intentional relationships with stakeholders specific to different research plans, hazards, and communities that can be leveraged to springboard DR2 activities in the context of a disaster. Engaged stakeholders may include government and community representatives with specific expertise or local ecological knowledge, as well as relationships with specific communities or populations disproportionately impacted by disasters. While these stakeholders may at times be the same as those represented on the DR2 committee, deeper and/or broader engagement in particular communities and with specific stakeholders may be necessary to both plan and implement for particular DR2 activities (e.g. site or population-specific protocols), and such relationships and engagements should be developed in advance of a disaster.

**2. Post-event Response and Recovery**

2.1 Research issue identification and prioritization

**2.1.1 Rapidly convene the DR2 committee to identify and prioritize event-specific research needs, including community perspectives**. The DR2 committee should convene immediately after a disaster that triggers DR2 plan activation occurs. One of the early focuses of the DR2 committee in the response phase is to determine the prioritized research agenda for the specific event, including cross walking information gaps and mission-critical unknown questions with research priorities identified pre-event. The DR2 committee should consult the previously compiled SME roster *(see 1.4.5)* and include SMEs in the DR2 committee if existing committee members do not have specific expertise in the disaster event. These SMEs should be consulted throughout the post-event response and recovery process. The committee may also consider engaging with affected communities to identify information needs. The committee should develop and share a list of high-priority research areas with academic public health/PHA leadership and staff and other relevant stakeholders.

**2.1.2. Continuously reevaluate research priorities based on evolving information needs**. In coordination with the DR2 liaison, the DR2 committee should monitor evolving event-specific information needs. In addition, students or volunteers should be engaged in activities to compile and synthesize existing and emerging research that addresses identified priorities. Research priorities should be updated based on event needs and evidence generation, and modifications to identified priorities should be communicated to relevant stakeholders.

2.2 Research Process

**2.2.1 Activate emergency response IRB processes and commence work on provisionally approved IRB protocols**. The predetermined processes and infrastructure for rapid ethical review of proposed studies should be activated *(see 1.2.1 and 1.2.2)*. Responsible IRBs should be notified that protocols that have received pre-event provisional approval should be activated, and requisite event-specific information should be provided.

**2.2.2 Pursue or activate funding opportunities and financial mechanisms to support DR2.** *(see 1.2.3)* In the near-term of the response, researchers and practitioners should consider all applicable funding opportunities and financing mechanisms identified pre-event. In addition, the DR2 committee should compile and regularly update a list of event-specific funding opportunities. The DR2 committee should also work with their school/college/program or university’s donor, corporate, and/or alumni relations office to identify non-traditional funding sources. As applicable, the DR2 committee should support funding applications by integrative research teams proposing to address event-specific research priorities, including through administrative, logistical, or grant writing support.

**2.2.3. Record information required by funders or IRBs using pre-established plans, tools, or templates.** Research teams implementing DR2 should be provided with plans, tools, and/or templates to facilitate timely grant and IRB reporting. As applicable, the DR2 committee should support reporting by integrative research teams working to address event-specific research priorities, including through administrative support.

**2.2.4 Review and consider recommending activation of administrative clearance or credentialing processes for data collection site access.** *(see 1.2.5)* The DR2 committee should review data collection and site access needs, as well as site safety and affected community considerations, and make recommendations to the DR2 liaison in the response and recovery management structure about activation of pre-established administrative clearance or credentialing processes. Through the established procedure, the DR2 liaison should communicate the recommendation to the relevant decision maker. If site access is granted, authorities/gate keepers should be informed of the decision, and the relevant investigator(s) should be informed of site specific procedures or guidelines.

2.3 Infrastructure and implementation

**2.3.1 Convene trained DR2 investigators and/or teams, and provide just-in-time supplemental or refresher training as needed**. Academic public health faculty, staff, students and PHA personnel who have been trained should be convened and deployed based on event-specific DR2 needs *(see 1.3.1 and 1.3.2)*. Refresher and/or and just-in-time supplemental training modules may be required. In a response setting, these trainings may be conducted in-person with live practice, via online informational modules, or with a virtual instructor depending on instructor and responder needs and resources. Training topics may include disaster research methods (e.g., sample collection, survey design best practices, database administration) and event-specific topics (e.g., biological mechanisms, engineering principles, clinical care basics) as relevant to the research response needs. During the response, both DR2 team leads should be asked to identify emergent gaps in teams’ skills and knowledge so that supplemental training can be deployed on an ongoing basis throughout response and recovery.

**2.3.2. Evaluate DR2 activities**. Plans to evaluate DR2 activities should be activated early on in the response, especially if process evaluation activities are planned. DR2-specific issues may be incorporated into regional or agency-specific after-action reports (AARs) or evaluations. The DR2 committee may also host independent evaluative activities, including DR2-specific AARs.

2.4 Relationships, coordination, and engagement

**2.4.1. Convene regular DR2 committee meetings.** Throughout the post-event period, the DR2 committee should coordinate involved investigators, troubleshoot DR2 issues that arise, and provide administrative, logistical, and operational support to the DR2 position integrated into the response and recovery management structure *(see 1.4.1).* The foundational relationships that were formed during the pre-event phase are particularly vital at this stage in order to make the committee a productive asset during disaster response. The committee should determine an appropriate convening schedule based on the needs of the disaster response. These meetings may be multiple times per week in the early phases of the response and eventually become less frequent as research response projects successfully launch. The frequency, structure, and membership of committee meetings should be continually evaluated during the response and into the recovery phase to ensure the schedule and content of meetings are best positioned to facilitate effective and efficient DR2 activities.

**2.4.2 Assign a DR2 liaison and deputy to the response and recovery management structure.** *(see 1.4.1)* A professional with event-relevant scientific knowledge and skills, relationships and connections, and decision-making authority within academic public health/the PHA should be assigned as the DR2 liaison. A deputy should also be assigned to ensure continuity.

**2.4.3 Review and activate institutional agreements including MOUs, data sharing agreements, and charters.** *(see 1.4.2)* Upon activation of the DR2 CONOPS plan, the DR2 committee should take stock of all existing DR2 agreements and identify any needs for disaster-specific adjustments or additions. If any additional or modified agreements are needed, these should be identified and addressed early in the response to avoid hindering research collaborations after they have already commenced. Agreement needs should be continually revisited to ensure they are sufficient for evolving event needs (e.g., during the transition to the recovery phase).

**2.4.4 Notify rostered experts that the response has been activated.** The committee should assess what information and expertise is likely to be needed in the near-term research response and contact relevant SMEs from the roster *(see 1.4.5)* to assess their willingness and availability to participate in the DR2. Willing and available investigators should be engaged on an as-needed basis throughout the DR2 to address event-specific information needs.

**2.4.5 Compile and refine a list of DR2 activities.** During the response, the DR2 committee should manage an ongoing list of relevant research activities to foster transparency, situational awareness, and efficient and effective transition of research findings to guide response and recovery decisions. This may include the title of the project, study objectives, timeline, research lead contact information, status updates, funder, resource needs, or other potentially relevant information as determined by members of the DR2 committee. Research activities may be compiled through surveys of principal investigators, regular event specific DR2 calls, or other means. This compiled list may also be used by the DR2 committee to engage in conversations with funders, donors or university officials about ongoing activities and resource needs.

**2.4.6 Facilitate real-time and post-event research translation.** The DR2 committee should engage with research teams conducting DR2 that has the potential to inform response or recovery decision making, and work with them to create opportunities to communicate findings with relevant public health practitioners leveraging processes and tools developed pre-event (e.g., research brief templates) (*see 1.4.2).* In addition, the DR2 committee should consider hosting a symposia or developing a bulletin that summarizes public health practice relevant research findings that can inform updates or improvements to disaster response and/or recovery plans.

**2.4.7 Implement research, hazard, and community-specific engagement plans, inclusive of impacted community representatives.** Upon activation of the response and recovery phase, the DR2 committee should activate research, hazard, or community-specific engagement plans to coordinate and collaborate with relevant stakeholders (*see 1.4.6*).

Key Informant Interview Guide:

**Understanding Research Collaboration Opportunities Between Schools of Public Health and Public Health Agencies during the COVID-19 Response**

**Key Informant Interview Guide**

**Purpose of the Study**

In 2021, the University of Washington will be the site of the next National Institute of Environmental Health Sciences Disaster Research Response Workshop, which aims to enhance capacity to conduct disaster research response at UW and across the federally funded research enterprise. As part of this process, we are developing tools and processes to enhance disaster research response. One part of this is to enhance opportunities to collaborate on disaster research with state and local public health agencies, such that research can be responsive to scientific gaps and operational information needs. We plan to share any tools developed broadly.

To this end, we are conducting a study to learn about how and if Schools of Public Health (SPHs) are working with state and local public health agencies to conduct applied or operationally-relevant research during the COVID-19 response, challenges encountered during the research collaboration process, and lessons learned that could be used to enhance future collaborative, disaster research response. We plan to synthesize these findings into what an “ideal” disaster research response process looks like for academic researchers and their local public health practice partners.

**Study Procedures**

Each interview will last approximately 30-45 minutes. We will not ask sensitive or personal questions during this interview; our questions focus on your SPH's collaboration with state and local public health agencies on research during COVID-19.

We would like to audio record this interview to ensure we are accurately summarizing your responses in our final report. We will send this recording to a professional transcription service to transcribe the interview.

The end result of the study will be a written report describing our findings. The report will only include aggregated data, and we will not include your name, organization, or your partner organization’s information without your explicit written consent. Interview data that has been de-identified may be placed in a data repository for use in future research, including to answer alternative research questions. Your name, organization, contact, or partner information will not be associated with any data that is shared in such a repository or with other researchers.

Despite these steps to protect your privacy and confidentiality, it may be possible to identify you based on your responses or other details that you share with us today.

**Other Information**

You may refuse to participate and you are free to withdraw from this study at any time without penalty or loss of benefits to which you are otherwise entitled.

**Questions**

Do you have any questions?

Do you consent to participate in this interview?

Do you consent to have this interview recorded?

**[turn recorder on]**

Pending consent: Great. We’ve turned the recorder on. Washington State law requires us to document consent for recording. Can you please reconfirm that you consent to have this interview recorded?

**Interview Guide**

4. Relationships, Coordination, Engagement

Q1: Did your SPH have pre-established research relationships with local, non-academic public health organizations before the COVID-19 outbreak? What was the nature of these relationships?

[Prompt: student internships, previous research or response collaboration, basic communication, etc]

Q2: Can you describe any research coordination your SPH has had with local non-academic public health agencies regarding COVID-19?

If yes:

* Did you have a plan or process for such research coordination before the event? Did you (if yes) adapt or customize it/ (if no) develop one in response to COVID-19?
	+ What challenges did you encounter?
	+ How do you think this research coordination could have been improved?
	+ Was there a central point of contact for SPH-public health agency coordination? Who?
	+ Was the SPH integrated into the research response via a formal structure? (E.g., incident command system)
	+ Were other SPHs or academic institutions involved in the research coordination process? Please describe.

If no:

* + What impeded research coordination? [Prompt= lack of staffing, no overlap in research interests, no previous relationship, etc]
1. Research Issue Identification & Prioritization

Q3: How has SPH worked with public health agencies to prioritize COVID-19 research response focus in your community? How did you communicate? [Prompt: apply for local study funding together, provide subject experts, discuss community needs] [Prompt: weekly meetings with SPH and public health agency representatives? Email circulations? Informal connections and conversations?]

1. Research Process Challenges

Q4: What challenges, if any, have investigators at your SPH had with your IRB on practice- or operationally- relevant research? (For example, their policies or processes) [Prompt: IRB coordinating well with the public health agencies, any ways you wish the IRB was involved or contributed differently]

Q5: What are the challenges and opportunities for getting funding to do disaster or COVID-19 research in collaboration with public health agencies?

Q6: What are the challenges and opportunities for your school’s grants and contracts offices when working with public health agencies on research (e.g., related to subcontracting or contractual work)? *(For UW is called office of sponsored programs)*

1. Infrastructure & Implementation Challenges

Q7: What tools or resources would help facilitate a more efficient collaborative disaster research response among SPH and public health agencies? [Prompt: training, staff, protocol sharing, sample coordination, testing materials/PPE, etc]

Q8: What does an ideal disaster research response process with your public health agency partners look like? [Prompt: what are the essential elements of a process that would facilitate working with public health agencies on operationally relevant research in the context of a disaster]?

Wrap- up:

Q9: Is there anything else you’d like to tell us about your experience collaborating with state or local public health agencies on disaster research response during COVID-19? In prior disasters?

This conversation has been very informative. Those are all the questions we have for you today.

Is there anything else you’d like to tell us?

Would you mind if we contacted you if we have additional follow-up questions?

Thank you!