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It Takes a Village: A Novel Process for Responding to Emerging Issues in Agricultural Health and Safety

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ABSTRACT

Agricultural and food production systems are constantly evolving in response to societal and environmental factors. These sectors are also laden with occupational hazards, creating an opportunity for emerging and re-emerging issues such as emerging markets and changing worker demographics. The Upper Midwest is a region of intensive agricultural production, with many states leading the United States in livestock and crop production. As a National Institute of Occupational Safety and Health Center for Agricultural Safety and Health, the Upper Midwest Agricultural Safety and Health Center (UMASH) is tasked with protecting the health and safety of the region's agricultural workers. UMASH implements an Emerging Issues program to effectively respond to emerging and re-emerging issues impacting agricultural health and safety in the Upper Midwest. To direct such work, UMASH developed a novel Selection, Planning and Action Process Model. This model guides all stages of the UMASH Emerging Issues response and emphasizes the ongoing need for monitoring, evaluation, and feedback from agricultural communities. In conjunction with the UMASH Process Model, the International Association for Public Participation (IAP2) Spectrum of Public Participation frames the work of the Emerging Issues Program in meaningfully engaging the community of stakeholders across all stages.

KEYWORDS

Agriculture; emerging issues; health; safety; framework

Introduction & background

Agriculture is not static but is ever-changing and diverse. The agricultural and food systems move in parallel with society's local, regional, and global demands, supply chains, new ways of growing food, and the environment. Work in agriculture has long been recognized as hazardous, with a greater diversity of threats to health and safety than most occupations.[1] This dynamic nature of agriculture presents emerging and re-emerging issues impacting its workforce, which may intensify these known occupational hazards.

The Upper Midwest, which the authors define as Iowa (IA), Minnesota (MN), North Dakota (ND, South Dakota (SD), and Wisconsin (WI), is a significant and growing source of agricultural production globally, accounting for approximately a third of national production expenditures.[2,3] Ubiquitous to this landscape are farms producing grains, hogs and pigs, cattle, milk, poultry and eggs, and hay.[2] The region is a leading producer in animal agriculture with national rankings of pork (IA #1, MN #2),[4] turkeys (MN#1, IA #7),[5] and dairy (WI #2, MN #7).[6] In addition, the landscape supports extensive crop production. Corn production is extensive, with Iowa and Minnesota in the top five states for production, number one and number five producing states respectively.[7] Similarly, soybean production (which is often in crop rotations with corn) is dominated in the Upper Midwest. Iowa and Minnesota make the top five states for production, coming in second and third for US production by state.[7] Other significant crops include alfalfa (hay), grains, beans, and peas, vegetables, nursery products, tree crops, and more.[8] Emerging markets include hops,[7] hemp,[9] aquaculture,[8] among others. Marked production changes have been occurring, from more animals produced on fewer farms,

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fewer farms with more acreage (along with an explosion of farms under 9 acres), volatile income, increased emphasis on edible production, and advancements in on-farm technology (i.e., elite animal genetics and autonomous, precision agronomy).[10]

This highly productive environment translates to a large number of agricultural workers who experience serious threats to health and safety.[1] For example, the fatal injury rate for crop production workers in 2019 was 17.4 deaths per 100,000 full-time workers and 22.2 for animal production and aquaculture, as compared to 3.8 for all private sector workers.[11] The rate of death is more than six times higher, and the incidence of injury is 1.7 times higher in agricultural work than in all occupations.[11] Animal agriculture poses additional risk for workers, including an increased rate of nonfatal injuries on farms with animals.[12] A study of zoonotic enteric infections in Minnesota indicated that the incidence of infections is much greater in people who live and/or work on farms with food production animals.[13]

Additionally, the people working in agriculture are increasingly diverse, including aging farmers, women, immigrant and migrant workers, and populations new to farming.[14–17] These populations face unique social and structural challenges to occupational health and safety and therefore have distinct and fluid needs.

UMASH Center

The Upper Midwest Agricultural Safety and Health (UMASH) Center was initially funded in 2011 through the National Institute of Occupational Safety and Health as a Center for Agricultural Safety and Health. These Centers were established in 1990 as a part of the Centers for Disease Control and Prevention to conduct research, education, and prevention projects in the agricultural, forestry and fishing industries.[1] UMASH is tasked with engaging in a spectrum of community-engaged, collaborative, and culturally responsive research and outreach to meet the health and safety needs of agricultural populations in the region. All UMASH work is guided by the One Health approach, which leverages multisectoral and transdisciplinary collaboration to understand and address health issues at the human-animal-environment interface.[18,19] One Health acknowledges the complex intersections between worker health, the agricultural industry, the environment, animal health, and farming practices.[18,19] In various combinations, these factors can increase, decrease, or change health and

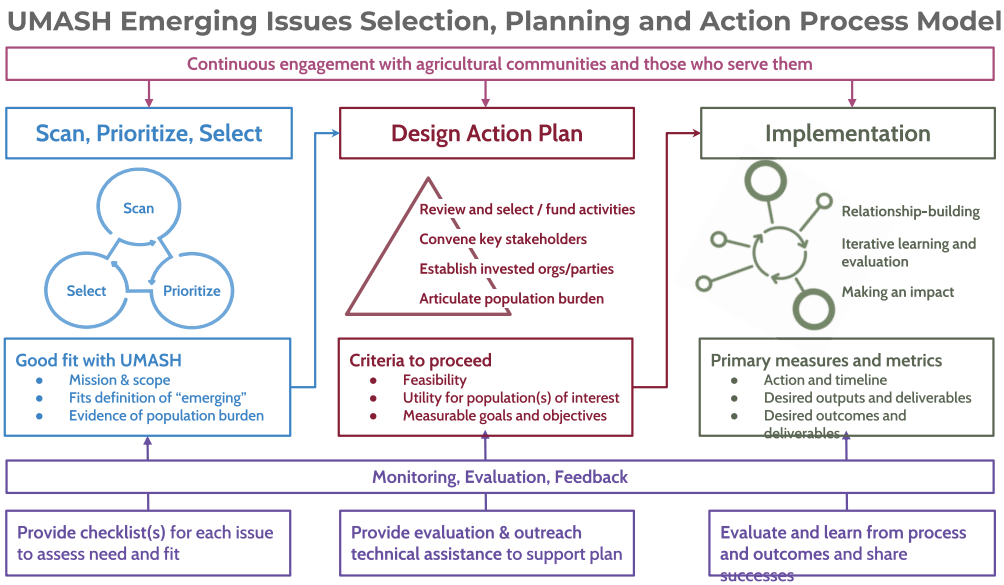

Figure 1. The UMASH Emerging Issues Selection, Planning and Action process model.

safety exposures, hazards, and risks to workers. For this reason, UMASH implements an Emerging Issues Program,[20] guided by the novel, internally developed UMASH Emerging Issues Selection, Planning and Action Process Model (UMASH Process Model) (see Figure 1) to apply the One Health approach and take multidisciplinary, nimble, and responsive action to address emerging and reemerging issues in agricultural health and safety. The Emerging Issues Program is an elective program funded by the National Institute for Occupational Safety and Health (NIOSH) to address new or emerging problems within the Center's region that were not present or recognizable at the time of funding application, and UMASH has implemented such a program since the Center's beginning in 2011. In the first cycle of funding (2011–2016), the Center Director used specific criteria to evaluate potential emerging issues for selection, including 1) importance to agricultural workers in the Upper Midwest, 2) timeliness, 3) opportunity for future work, and 4) engaging new individuals in agricultural health and safety work. In the second cycle of funding (2016–2022), with a more intentional focus on the Emerging Issues Program, the evaluation team was tasked with creating a more formal Scanning, Selection, and Action Model for addressing emerging and re-emerging issues.

This commentary will describe UMASH's development, application, and implementation of the UMASH Process Model and make recommendations for applying our model for building capacity, forecasting, and responding to emerging and re-emerging issues.

UMASH process model

As displayed in Figure 1, the model begins with a Scan-Prioritize-Select process, leading to designing an action plan and supporting implementation of regional interventions. As shown in the figure, monitoring, evaluation, and feedback processes are integrated across the entire process to assess needs and fit, provide technical assistance to support planning and implementation, and to understand the process, outcomes, and successes. The Emerging Issues program is intended to be agile and responsive to emerging needs; therefore, each component has significant flexibility built in to accommodate a variety of topic areas and project types, ranging from basic research to applied interventions. This flexibility is critical for responding to issues that require immediate engagement and action (i.e., recent deaths due to grain entrapments due to weather conditions), as well as issues that are highly complex or "wicked" (i.e., mental health in agricultural communities).[21]

A Scan-Prioritize-Select process is used to identify the most pressing issues, key collaborators, and strategies for response. In this process, UMASH leverages the full range of the International Association for Public Participation (IAP2) Spectrum of Public Participation, from *informing*, where information is simply provided, to *empowering*, where community members are decision-makers in the goals and outcomes.[22,23] The scanning process involves building relationships with community members and stakeholders, reviewing available literature, and conducting informal social listening. UMASH has a diverse network of health and safety practitioners, researchers, students, educators, and members of the agricultural workforce. At the heart of this network is an external advisory board consisting of representatives of the agricultural workforce. UMASH interfaces with its network through in-person and virtual events and email, social media, and web communications. For example, an online form to solicit new or reemerging issues is posted on the UMASH website and shared with stakeholders. In addition, Emerging Issues team members and UMASH students regularly review existing academic literature and media materials. This process ranges from conducting a formal literature review to engaging in regular informal social listening processes to characterize current regional needs. After scanning, issues must be prioritized and selected. Priority issues that are a good fit with UMASH have the following characteristics: 1) compatibility with the mission and scope of UMASH, 2) fit with the definition of emerging or re-emerging, and 3) existing evidence of population burden. UMASH's mission and scope – to improve the health and safety of agricultural workers, owner-operators, and communities in the Upper Midwest – are informed by the priorities of the populations of interest in the region, the UMASH advisory board,

National Occupational Research Agenda (NORA), and NIOSH.[24]

Once an issue is identified, an action plan is designed. If this is a particularly new or novel issue, UMASH coordinates an in-person or virtual forum to convene key stakeholders, share what is known, and strategize possible actions. These forums provide a sense of direction and often a White Paper for Literature.[25,26] Then, teams (research teams, community organizations, etc.) representing different stakeholder groups are invited to design and propose a project that works to address the issue at hand. The plans are reviewed by center leadership, with input from other center investigators and, as appropriate, external experts, including advisory board members. Reviewers use three main criteria to assess project proposals for funding: 1) feasibility, 2) utility for the population(s) of interest, and 3) the inclusion of measurable goals and objectives that are likely to lead to impactful outcome(s). Further, priority is given to projects likely to develop new interdisciplinary partnerships. UMASH supports one or more project ideas annually and works alongside project teams to support design, implementation, and evaluation processes.

The selected action plans are then implemented to achieve desired outputs, outcomes, and deliverables in a specified timeline. The UMASH outreach and communications teams provide assistance with recruitment, dissemination, and stakeholder engagement to project teams as needed. The evaluation team assists with applied research methods and instrument development, learning and development, and summative assessments of intended outcomes and benchmarks. To illustrate the application of the model at UMASH, we offer the following case studies.

Case studies

Leveraging the Scan, Prioritize, Select process, chronic stress and poor mental health outcomes were identified as an emerging and re-emerging issue in 2017. A forum at a farm show identified farmer suicide as a concern area, which alerted the organization to the issue. This was followed by prominent media coverage, internal literature reviews, further community engagement, and frequent discussions with partners. A working and planning group of partners and stakeholders convened to design action plans and envision different outcomes. As a result, we hosted a multidisciplinary forum to frame and discuss the issues and amplify the voices of experts in agricultural and rural health. This forum laid the groundwork for a request for proposals (RFP) where UMASH reviewed and awarded Partner Project grants to community organizations and individuals working to understand chronic stress and poor mental health outcomes, and ultimately support the agricultural community. Four projects were funded, which ultimately reached over 10,000 individuals through various programming, and collected data to help better understand the needs and behaviors of the population.[26]

Other areas of focus included antimicrobial risks for agricultural workers, aging on the farm, safety education, hazards for manure applicators, and support for rural health care teams.[20] These were often supported with a half day or day symposium reviewing the issue with working group activities in the afternoon wrestling with key issues identified in the symposium. These meetings were attended by a variety of stakeholders from varied disciplines. This supports the interdisciplinary and One Health approach of the Center. Additionally, the Advisory Board, industry representatives, legislators and other Center stakeholders would solicit new ideas and issues for consideration from timely events or needs. This included responding to emerging diseases (e.g., COVID-19, Highly Pathogenic Avian Influenza (HPAI), and African Swine Fever), regional issues related to climate change (e.g., recent drought or heat events) or recent tragedies (e.g., grain bin deaths).

Conclusion

It is more critical now than ever to proactively build this kind of infrastructure, capacity, and agility into our existing educational and research programs to respond to emerging challenges. We often forget that agriculture is diverse and changing. We have demonstrated a scan, prioritize, and select process that facilitates a nimble response, guided by the communities we serve, that is

structured around the criteria, values, and planning for an interdisciplinary intervention to support our agricultural communities. We share the successes of this framework to encourage other programmatic outreach and research programs to consider this model of integrating an emerging issues framework/model into their ongoing work.

The success of this work is in-part due to the strategic and purposeful community listening, engagement, and involvement. As part of this process, we focus our work on meaningfully across the entire spectrum of community (or public) participation and sharing our findings and impacts back out to our stakeholders. In doing so, we find a meaningful engagement and empowerment of the audience we serve. The community partnership projects have created innovative interventions, programs, and studies that reflect the emerging interests and concerns of stakeholders in our agricultural communities in the Upper Midwest.

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