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Impact Indicators for Community Garden Programs: Using Delphi Methods to Inform Program Development and Evaluation

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SUMMARY. With growing interest in food system solutions to address poor health outcomes related to preventable chronic diseases, organizations and researchers are examining the value of community gardens as interventions to promote individual and community health. Research suggests that participation in community gardens improves access to fresh, healthy foods and increases fruit and vegetable consumption. In addition to these physical benefits, research also documents a variety of social and communal benefits, by expanding social capital, stabilizing neighborhoods, and cultivating relationships. Unfortunately, most of these studies focus on a specific case, cross case, or intervention studies within a geographically specific locale. Learning lessons from successful community garden programs can be difficult because community gardens often rely on the synergy of a complex network of support agencies that assist in various technical and educational capacities. The purpose of the study was to demonstrate the use of a framework for program development and evaluation that stakeholders, including extension, can adopt to show program outcomes. The framework used a Delphi approach with a diverse panel of community garden stakeholders to reach consensus about program outcomes. The study demonstrated that the panel could reach consensus on a variety of short-, medium-, and long-term outcomes.

Community gardens are shared spaces that confer both physical and social benefits to participants (Draper and Freedman, 2010; Litt et al., 2011). These spaces are found in both rural and urban settings, across socioeconomically diverse neighborhoods, at workplaces, places of worship, social service sites, and in schools. With growing interest in food system solutions to address

poor health outcomes related to preventable chronic diseases, organizations and researchers are examining the value of community gardens as interventions to promote individual health and community well-being. Research indicates that community garden participation improves access to fresh, healthy foods (Allen et al., 2008; Evans et al., 2015; Poulsen et al., 2014) and increases fruit and vegetable consumption (Alaimo et al., 2008; Hanson et al., 2017; Litt et al., 2011). In addition to these physical benefits, research also documents a variety of social and communal benefits, by expanding social capital, stabilizing

neighborhoods, and cultivating relationships (Glover et al., 2005; Gorham et al., 2009).

Much of the research focuses on case, cross-case, and intervention studies within geographically specific locales. Draper and Freedman (2010) conducted a comprehensive literature review on the benefits, purposes, and motivations of community gardening in the United States. Of the 55 studies reviewed, case studies comprised 40% and interventions comprised 45%. This mirrors extension research, which emphasizes case and multisite case studies on individual programs (see examples in Blaine et al., 2010; Landry et al., 2015) or on specific topics within community gardening, such as garden design (Bradley et al., 2014) and management (Drake and Lawson, 2015a).

One outlier is a recent, comprehensive study by Drake and Lawson (2015b) that surveyed 445 community garden organizations from across the United States and Canada representing 8550 gardens that focused on community garden benefits and challenges. Respondents agreed on more than 75% of the primary or secondary benefits: food production and access (99.7%), nutrition/improved diet (99.5%), social engagement/well-being (99.5%), exercise/physical activity (98.6%), individual personal satisfaction (97.8%), education specifically about gardening (96.7%), environmental benefits (95.9%), intergenerational activities (94%), education (86.1%), intercultural communication (85.1%), and neighborhood revitalization (78.7%). These findings were further supported by the results of an open-ended question in which participants identified food production, social engagement, education, and nutrition as the most significant benefits. The authors noted, "While some academic literature focuses on a particular outcome—food production, nutrition, community engagement, etc.—it seems that organizations may accept multiple and varied outcomes." Although this study provided a comprehensive lens toward program benefits, it did not demonstrate a process for achieving consensus among diverse stakeholder groups on the central outcomes that should be considered for an integrated development and evaluation model for community gardens.

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The practice of community garden support is often a “complex web of interactions across scales as communities, local and extra local non-governmental organizations, and government agencies plan and implement community gardens” (Drake and Lawson, 2015b). In short, a patchwork of highly contextualized agencies and programs, which vary from town, municipality, county, and state, delivers garden support. Part of this complex web of garden support agencies are local county extension offices, which assist community gardeners in various technical and educational capacities through workshops, site visits, demonstration gardens, and plant clinics, to name a few services. Because of the diversity of stakeholders, the many potential services provided by extension, and the variety of physical and social outcomes, extension agents need a consistent framework for community garden program development and evaluation. We believe that a set of broadly applicable impact indicators for a program logic model would provide an outcome-driven framework to inform such efforts (Israel, 2001).

Impact indicators provide a clear and concise means for positioning community garden programs to address questions of program efficacy and impact. As such, it is critical that these programs clearly define, capture, and communicate their impacts (Starr and Hattendorf, 2013). Impact indicators also help to outline and evaluate pertinent strategies to address the challenges related to garden loss, including declining participation, lack of interest by gardeners, and loss of land (Drake and Lawson, 2015b).

Logic models provide an effective framework for educators and other key stakeholders to develop program plans for the development and evaluation of community garden programs based on agreed-upon outcomes (Israel, 2001). Table 1 outlines the short-, intermediate, and long-term outcomes included

in the logic model framework. This framework facilitates program evaluation to extend beyond simply measuring learning outcomes by allowing stakeholders to specify intended behavioral and conditional impacts of community garden programs.

In the planning phase, these impact indicators (a vision of success) would be used to develop program objectives to guide the overall evaluation framework and associated evaluation tools (Israel, 2001). The logic model identifies a causal relationship between the program (inputs, activities, and participation) and its intended outcomes using a program theory of change. Israel (2001) explains that by organizing programs in this manner, the programs can measure, learn, and improve intended outcomes and make proactive changes if needed. In addition to supporting program planning and evaluation efforts, logic models can be used to communicate a community garden’s purpose and efforts and can be integrated into grants and funding. The present study addresses the need to develop these indicators as part of community garden planning and evaluation activities.

Developing a successful community garden program is a collaborative effort predicated on the ability of key stakeholders to effectively evaluate and communicate success. The purpose of the study was to demonstrate the use of a framework for program development and evaluation that stakeholders, including extension, can adopt to show program outcomes. It did so by using an innovative tool, the Delphi technique, which a breadth of stakeholders can adopt. The objective of the study was to identify the most meaningful outcomes (short-term, medium-term, and long-term) that could be included in a program logic model and be used to measure the success of such programs.

Methods

This statewide study used the Delphi technique to identify key

outcomes that should be incorporated in evaluation frameworks across a variety of community garden programs (Delp et al., 1977; Linstone and Turoff, 2002; Warner, 2015). The Delphi technique provides a structured process for reaching a consensus among a panel of experts through multiple rounds of anonymous feedback, or iterations (Warner, 2015). It is frequently used in the educational context to develop consensus for program priorities and objectives that can help guide planning and evaluation efforts of programs.

The study began in Feb. 2017 and finished in May of the same year. The population for this study consisted of key community garden experts who held various roles in community garden programs across the state of Florida. First, an advisory committee representing state agencies, nonprofits, institutions of higher education, and various school systems was asked to create a list of potential expert panel members. The advisory committee selected individuals who had a breadth of experience and expertise through different roles in community garden programs and types of organizations, geographic diversity, and varied perspectives (Stufflebeam et al., 2012). The advisory committee provided a total of 101 unduplicated nominees. From this list, all potential participants were contacted by the principal investigator to provide them with additional information on the study and solicit their help. The 53 individuals agreeing to participate received a copy of the initial survey to provide time for thoughtful response.

The study used a series of three online surveys, which were validated using an expert panel of program evaluators, agricultural and horticultural educators, and state school garden coordinators not included in the study. The first round of the study used a survey with the open-ended item: “Please list all of the outcomes that result from a successful community gardens program. Make sure to consider short-term outcomes (changes in knowledge, attitudes, skills and aspirations), medium-term outcomes (behavioral change/adoption of practices), and long-term impacts (societal, economic and environmental) when developing this list.” This open-ended question item was used to create

Table 1. The outcome types used in a logic model for educational programs.

Outcome type	Description
Short term	Knowledge, attitudes, skills, and aspirations
Medium term	Behavior change or adoption of best practices
Long term	Social, economic, and environmental conditions

a comprehensive list of possible program outcomes.

Using the round 1 data, the researchers used a three-step process of content analysis to categorize the responses for developing the round 2 survey (Merriam, 2009). Three researchers coded together to develop the initial themes, whereas an external member reviewed them and provided feedback (Blair, 2015). First, the data were assessed line by line and provided with codes. The responses were then read again multiple times until categories became well-defined. Then the individual categories were examined to create themes based on meaningful relationships with other categories and subcategories. The researchers then used the logic model framework to organize the themes within the short-term, medium-term, or long-term outcome levels. The researchers used the logic model as the final step of data organization so that the subsequent surveys would

solicit respondent evaluation based on similar outcome levels.

In the second survey, respondents were asked to rate items identified in round 1 on a seven-point Likert-type scale (1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = neither agree nor disagree, 5 = somewhat disagree, 6 = disagree, 7 = strongly disagree). The respondents were asked to frame their level of agreement based on how meaningful they felt it was to include such outcomes in the evaluation of a community garden program to ensure its success. The respondents were asked to consider feasibility to ensure that community garden educators and other key stakeholders would have the capacity to evaluate such outcomes (Table 2). The researchers used the criteria of two-thirds (66.67%) of group members choosing 1 = strongly agree or 2 = agree as the common definition of consensus, and items that met this criteria were included in the third survey

(Boyd, 2003; Conner et al., 2013; Harder et al., 2010; Shinn et al., 2009).

The third and final questionnaire asked the respondents to identify their level of agreement on the same Likert-type scale with the shortened list of outcomes resulting from round 2 (Table 3). The same two-thirds rule was applied to this round as the predetermined definition of consensus. The design of Delphi studies, including the number of rounds employed, is open to modification by the researchers. As most of the items achieved consensus following round 3, we decided to conclude the study at this point.

Results

Breakdown of participant demographics

In each round of the survey, respondents provided information regarding the organization type that they represent, the role(s) they hold with the garden or garden program,

Table 2. Survey items from round 2 of the Delphi study asking participants to identify their level of agreement with the outcomes listed.

Item no.	Survey item
1	Below is a compiled list of the short-term outcomes (knowledge, attitudes, skills, and aspirations) obtained from phase 1 of this study. Please identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program. While making your decisions on your level of agreement with each item, please take into consideration how realistic or feasible you believe it would be to attain each outcome.
2	Below is a compiled list of the medium-term outcomes (behaviors/practices) obtained from phase 1 of this study. Please identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program. While making your decisions on your level of agreement with each item, please take into consideration how realistic or feasible you believe it would be to attain each outcome.
3	Below is a compiled list of the long-term outcomes (social, economic, and environmental conditions) obtained from phase 1 of this study. Please identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program. While making your decisions on your level of agreement with each item, please take into consideration how realistic or feasible you believe it would be to attain each outcome.

Table 3. Survey items from round 3 of the Delphi study asking participants to identify their level of agreement with the outcomes listed.

Item no.	Survey item
1	Below is a shortened list of the short-term outcomes (knowledge, attitudes, skills, and aspirations) obtained from the responses provided during phase 2 of this study. The list represents the immediate outcomes that the group demonstrated a level of agreement on. Please review this new list and identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program.
2	Below is a shortened list of the medium-term outcomes (behaviors/practices) obtained from the responses provided during phase 2 of this study. The list represents the medium-term outcomes that the group demonstrated a level of agreement on. Please review this new list and identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program.
3	Below is a shortened list of the long-term outcomes (social, economic, and environmental conditions) obtained from the responses provided during phase 2 of this study. The list represents the immediate outcomes that the group demonstrated a level of agreement on. Please review this new list and identify your level of agreement on the importance of including each measure in planning for and evaluating the success of a community garden program.

the geographic region where their work takes place, and the number of years of experience they have working with community gardens. To delineate geographic area, we used the state of Florida's Cooperative Extension Service districts. Overall, across all three rounds, the participants in this study had an average of ≈ 10 years (10.58) of experience working with community garden programs. Table 4 provides a breakdown of the rest of the respondent demographic information per round.

Delphi results by round

ROUND 1. Fifty-five outcomes were identified in the first round. In Table 5 these are broken down into short-, medium-, and long-term outcomes. These categories resemble the outcome levels within the logic model and were part of the researchers' process of data categorization following the first round. There were slightly more long-term outcomes than medium- or short-term outcomes. The response rate for this round was 81% ($n = 43$).

ROUND 2. In round 2, participants reached consensus on 28 of the 52 items that were initially provided as meaningful outcomes for community garden programs (Table 6). The response rate for this round was 75% ($n = 40$). The outcomes with the highest level of agreement in the short-term outcomes range centered on understanding and appreciation of the benefits of growing food, knowledge and skills for best practices in gardening, increased appreciation and knowledge of local food systems, and increased connection to community. The outcomes with the highest level of agreement in the medium-term range were predominantly focused on the increase in healthy food consumption, increased time spent outdoors, mentoring of new gardeners, and growing food to supplement diets. The outcomes with the highest level of agreement in the long-term outcomes range included increasing healthy food access, the creation of inclusive environments, improved mental health, garden sustainability, and increased educational opportunities for lifelong learners. Twenty-seven outcomes fell below the two-thirds threshold and were eliminated from further study.

ROUND 3. In round 3, participants were provided with a shortened list of

Table 4. A breakdown of the participant demographics per round of the Delphi study including organization type, role(s) in the garden, and geographic area(s) of Florida where the program takes place.

Demographics	Round 1 ($n = 43$) [no. (%)] ^z	Round 2 ($n = 41$) [no. (%)]	Round 3 ($n = 45$) [no. (%)]
Organization			
University	21 (42.1)	15 (38.5)	16 (35.6)
State agency	0 (0)	1 (2.6)	1 (2.2)
Nonprofit	9 (23.7)	8 (23.7)	11 (24.4)
Elementary school	2 (5.3)	3 (5.3)	4 (8.9)
Middle school	3 (7.9)	3 (7.9)	2 (4.4)
School board/district	2 (5.3)	2 (5.3)	2 (4.4)
Other	6 (15.8)	8 (15.8)	9 (20)
Roles ^y			
Administrator	8	16	18
Educator	27	25	28
Professional development	12	6	4
Garden team member	14	8	10
Volunteer	3	8	9
Other	9	8	11
Geographic area ^y			
Northwest	3	4	5
Northeast	2	2	3
Central	3	3	4
South-central	23	26	26
South	4	2	5
Statewide	3	3	2

^zDenotes the percentage of respondents for each organization type. Percentages are only provided for organization type.

^yBoth geographic region and roles were multiple response items, so each respondent may have to provide multiple responses based on their work.

28 items, with consensus achieved on 26 of them. Table 7 contains the summary data for this round. Forty-five of the 53 panel members responded in this round with an 85% response rate.

Conclusions

Using the Delphi technique proved to be a useful approach in gaining the input of a diverse panel of key experts in the identification of a set of agreed outcomes that are essential to community gardens. The panel reached consensus on nine short-term outcomes, nine medium-term outcomes, and eight long-term outcomes. As the panel of experts represented the diversity of stakeholders involved in community gardens across the state, it provided a comprehensive and holistic lens to the Delphi technique that included varied interests, expertise, and perspectives.

This process shows how a network of key stakeholders that exist in the context of community gardens can work together to develop an outcome-driven program. In addition, this model provides a basis for identifying

Table 5. Breakdown of the number of outcomes per outcome level as a result of the analysis of the round 1 survey responses.

Outcome type	Outcomes (no.)
Short term	16
Medium term	17
Long term	22

a program's performance measures because components that are important enough to include in a logic model should also be the focus for performance measurement (Hatry, 1999; Israel, 2001). It is important to take the results of this study into consideration when planning or refining a community garden program, but should not be viewed as a panacea as local needs should be integrated into planning decisions. The results have the potential to inform a comprehensive framework for community garden program development and evaluation that extension faculty and staff, and other community garden key stakeholders, can adopt and implement to consistently demonstrate positive program outcomes across geographic regions.

Table 6. Summary of the Delphi study round 2 results showing the percentage of participants who chose strongly agree or agree for the importance of the inclusion of each item in the evaluation of community garden programs.

Outcome	Strongly agree/agree (%)
Short-term outcomes	
Gardeners understand and appreciate the benefits of growing their own food	92.3
Gardeners demonstrate increased knowledge and skills for best practices in gardening (ornamental and edible)	82.1
Increased appreciation and knowledge for local food systems (e.g., where food comes from)	79.5
Increased connection to community (awareness, appreciation, and respect)	79.5
Gardeners increase their ability to teach others and share what they have learned about gardening	76.9
Gardeners enjoy and exhibit an appreciation for nature	74.4
Garden members' attitudes change toward healthy foods and are more willing to include more vegetables into their diet	74.4
Gardner's perceptions of well-being improves	71.08
Gardeners increase their knowledge in preparing healthy meals from the garden	69.2
Gardeners increase their knowledge of organic gardening and understand the best management practices to grow organic produce	69.2
Gardeners demonstrate increased leadership and problem-solving skills	69.2
Gardeners have increased knowledge for engaging the community in developing a garden team and participating in garden activities	64.1
Municipalities become more aware and accepting of providing land for community gardens	59.0
Gardeners understand nutrition as it relates to their food choices and overall health	57.9
Gardeners exhibit increased knowledge of natural sciences as it relates to gardening	53.8
Gardeners have increased knowledge for sustaining the gardens financially	48.7
Medium-term outcomes	
Increase in healthy food consumption (e.g., fruits and vegetables)	82.1
Garden and community members spend more time outdoors	82.1
Gardeners mentor newer and future gardeners	79.5
Gardeners are able to supplement their diets with the food that they grow	79.5
Gardeners share knowledge and experiences with each other	76.9
Gardeners share the value of growing foods to get others interested in gardening	76.9
Community gardens develop organizational management practices and policies (rules and regulations, garden workday plans, conflict resolution process, etc.)	76.9
Garden members increase their level of physical activity and exercise	73.7
Gardeners implement best management practices for gardening	69.2
Community members become involved in the garden	65.8
Gardeners explore new organic techniques, native plants, new varieties, and postharvest techniques (canning/preserving)	64.1
Gardeners and community members become more engaged in their neighborhoods	59.0
Parents and children garden together	59.0
Community gardens donate foods and share their excess produce with others	57.9
Facilitate community engagement by increasing the amount of community events offered	53.8
Gardens apply for and receive community garden grants	48.7
Parents and children cook together	48.7
Long-term outcomes	
Increased accessibility to healthy, fresh foods	84.6
Gardens serve as places for inclusive interactions and engagement (diversity of generations, ethnicity, races, etc.)	79.5
Gardens improve mental health among its participants	79.5
Gardens sustained over multiple seasons	76.9
Provides educational opportunities to lifelong learners	74.4
Increase in the number of community gardens	71.8
Increase in beautiful neighborhoods (e.g., more green space and less abandoned property)	71.1
Increase in the number of all garden types (school, community, and backyard gardens)	68.4
Increase in environmental health (e.g., support wildlife, provide healthier local water bodies, and pollution reduction)	64.1
Local communities are more food literate	64.1
Resilient communities	64.1
Increased sense of community and community responsibility	63.2
Increase in partnerships	59.0

(Continued on next page)

Table 6. (Continued) Summary of the Delphi study round 2 results showing the percentage of participants who chose strongly agree or agree for the importance of the inclusion of each item in the evaluation of community garden programs.

Outcome	Strongly agree/agree (%)
Produce grown from garden provides savings from food costs	56.4
Increased walkability and bikeability of neighborhood	56.4
Increase in local food reliance	56.4
Community members benefit financially from garden products and skills	53.8
Community members and gardeners are healthier (reduction in body mass index, decreased risk of obesity, diets more diverse, etc.)	48.7
Increase in partnerships for school gardens	47.4
Increase in property value	39.5
Reduction in local crime	33.3
Reduction in the amount of land developed	28.2

Table 7. Summary of the Delphi study round 3 results showing the percentage of participants who chose strongly agree or agree for the importance of the inclusion of each item in the evaluation of community garden programs.

Outcome	Strongly agree/agree (%)
Short-term outcomes	
Increased appreciation and knowledge for local food systems (e.g., where food comes from)	83.70
Increased connection to community (awareness, appreciation, and respect)	83.70
Gardeners understand and appreciate the benefits of growing their own food	81.80
Gardeners increase their ability to teach others and share what they have learned about gardening	79.10
Garden members' attitudes change toward healthy foods and are more willing to include more vegetables into their diet	79.10
Gardeners increase their knowledge in preparing healthy meals from the garden	79.10
Gardeners enjoy and exhibit an appreciation for nature	76.20
Gardeners demonstrate increased knowledge and skills for best practices in gardening (ornamental and edible)	75.00
Gardeners' perceptions of well-being improve	72.10
Gardeners increase their knowledge of organic gardening and understand the best practices to grow organic produce	65.10
Gardeners demonstrate increased leadership and problem-solving skills	58.10
Medium-term outcomes	
Gardeners are able to supplement their diets with the food that they grow	86.00
Increase in healthy food consumption (e.g., fruits and vegetables)	83.70
Garden and community members spend more time outdoors	81.40
Gardeners share knowledge and experiences with each other	81.40
Community gardens develop organizational management practices and policies (rules and regulations, garden workday plans, conflict resolution processes, etc.)	79.10
Gardeners implement best management practices for gardening	79.10
Gardeners share the value of growing foods to get others interested in gardening	76.20
Gardeners mentor newer and future gardeners	74.40
Garden members increase their level of physical activity and exercise	72.10
Long-term outcomes	
Gardens serve as places for inclusive interactions and engagement (diversity of generations, ethnicity, races, etc.)	90.90
Increased accessibility to healthy, fresh foods	88.60
Gardens improve mental health among its participants	84.10
Gardens sustained over multiple seasons	79.50
Provides educational opportunities to lifelong learners	79.50
Increase in the number of community gardens	77.30
Provides educational opportunities to lifelong learners	76.70
Increase in the number of all garden types (school, community, and backyard gardens)	76.70

The results align with the outcomes drawn from the literature that relate to improving access to healthy foods (Allen et al., 2008; Evans et al.,

2015; Poulsen et al., 2014) and increasing fruit and vegetable consumption (Alaimo et al., 2008; Hanson et al., 2017; Litt et al., 2011), while

expanding the set of outcome indicators for the social and communal benefits that community gardens produce (Glover et al., 2005). Furthermore, the

results support the findings on benefits of community garden participation described by Drake and Lawson (2015b) in their research including food production and access, nutrition/improved diet, social engagement/well-being, exercise/physical activity, individual personal satisfaction, education specifically about gardening, intergenerational activities, education, and intercultural communication. This study also highlighted additional outcomes related to improving the mental health of community garden participants (Pitt, 2014; Shanahan et al., 2015). It shows that by giving individuals an opportunity to reconnect to nature through gardening, those with issues of mental health, anxiety, and stress experience positive results stemming from their engagement with community gardens. In addition, this study highlights the educational opportunities that community gardens provide for lifelong learners (Merriam and Kee, 2014). By creating a better appreciation for themselves and nature, this study provides a rich set of outcomes that will help those planning for community gardens to be successful.

Several of the outcomes, such as increasing connections to community, demonstrating increased leadership and problem-solving skills, and gardeners mentoring newer and future gardeners, can address key community garden challenges. Each of these outcomes can be tied to pertinent strategies to address the challenges identified by Drake and Lawson (2015b) as primary to garden loss: declining participation and lack of interest by gardeners, followed by loss of land. Furthermore, the researchers found that the most significant challenges include funding, participation, land, and materials. Using the outcomes identified in this Delphi study in tandem with research-identified challenges to community garden success can assist horticulture professionals and support organizations with developing and implementing programs that focus on garden sustainability, and to intentionally address components that contribute to garden failure early on in garden development.

As the results of this study were organized similarly to a logic model, horticultural professionals tasked with developing educational activities may better understand how to influence participants' knowledge, attitudes,

skills, and aspirations necessary to achieve behavior change or the adoption of best practices (Israel, 2001). Likewise, those responsible for evaluating program performance can better understand when to administer evaluative tools and how they should be structured (Israel, 2001). Those who are currently engaged in community garden programs might consult the findings of this study to explore their program's impacts and examine possible changes to align with desired outcomes. Future community garden programmers should apply appropriate outcomes to their planning and long-term evaluation activities.

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