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INTEGRATING PUBLIC HEALTH IN LAND REUSE AND REDEVELOPMENT:

Part 3: Public Health Indicators Associated With Land Reuse and Redevelopment: Results of a 40-Community Analysis

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Editor's Note:

The National Environmental Health Association is publishing a three-part series that highlights collaboration and partnerships with the Agency for Toxic Substances and Disease Registry (ATSDR) and redevelopment stakeholders to promote environmental health and land reuse as environmental and public health practices. This series will serve as a guide for identifying new and existing resources that can be adopted at the local environmental health level to safely reuse environmentally impacted land to improve community health outcomes. The conclusions in this series are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention and ATSDR.

Background

This final series installment highlights the development of a set of community-derived public health indicators associated with land reuse and redevelopment created using the Agency for Toxic Substances and Disease Registry's (ATSDR) Action Model (ATSDR, 2019). We designed the Action Model to engage communities in land reuse and redevelopment plans with a goal to measure changes in overall community health status. To track these changes, the Action Model promotes the development of community-derived health measures across a broad range of public health categories, from physical and mental health to environmental and economic health.

ATSDR introduced the first three Action Model pilot communities in a publication in the July/August 2013 issue of the *Journal of Environmental Health* (Berman & Forrester, 2013). By 2018, over 45 different communities across the U.S. have used the Action Model in redevelopment planning. Our objective was to create a data set of types of community-derived public health indicators associated with land reuse and redevelopment. Our secondary objective for creating the set of indicators was to provide a resource to accompany

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the Action Model that communities can use for measuring outcomes of land reuse and redevelopment activities that can lead to improved overall community health status.

Methods

Communities who used the Action Model were community partnership pilot communities (i.e., communities in which we provided technical assistance on land reuse) or grantees from a past funding program (i.e., ATSDR community health projects related to contamination at brownfield/land reuse sites). Collaborative relations with over 45 Action Model communities provided us access to these Action Models and an opportunity to consolidate the models with the intention of developing a set of community-derived public health indicators associated with land reuse and redevelopment. We ultimately consolidated 40 Action Models to a set of 69 public health indicators through an iterative process of data consolidation and assessment:

1. **Abstraction**: We abstracted all indicators from the Actions Models into Microsoft Excel, resulting in several hundred different community-derived indicators. We categorized indicators by various community-selected health categories in one spreadsheet. Categories were not modified at this time.

2. **Consolidation**: We combined or separated multiple duplications of public health categories and multiple duplications of indicators. This work required multiple iterations. For example, the indicator of access to green space appeared under categories of Environment, Built Environment, and Economy. We eliminated these duplicates and moved this indicator under Environmental Improvement as it appeared there more frequently. We then grouped the indicators related to access to green space and recreation into one category (e.g., trails, parks, and playgrounds, to name a few). An indicator related to partnership and funding for environmental improvement efforts appeared under both Environment and Economy but more frequently under Environment. As such, we grouped these indicators under a new category called Environmental Resources. We did not include indicators that were specific to only one community, such as odor issues.

3. **Recategorization**: With the exclusion of indicators specific to only one community, anywhere from a minimum of 4% to a maximum of 58% of communities derived common indicators. The average percentage of communities that derived similar indicators was 18% and the median percentage that derived similar indicators was 13%. We rounded the average value of communities that derived common indicators to 20% and selected that as the cutoff value for inclusion in the data set. We then grouped indicators that were commonly derived among the 40 communities under 9 community health categories. The regrouping of indicators in the consolidation process made some community-selected category names irrelevant and warranted the renaming categories. Additionally, it justified providing a standardized definition for each category to accurately reflect its group of indicators.

4. **Clarification**: We added details and guidance to indicators related to changes in environment and community health outputs or outcomes associated with

redevelopment to aid in measurement. To do so, we included the following factors:

- **Data availability/ease of collection**: Action Model communities typically relied on publicly available or community-collected data, such as property value assessments,U.S. Census data, state vital statistics data, visual surveillance, and community-led surveys. They shared these data sources with ATSDR. When creating community-derived indicators, it is important to select indicators for which there are available data or for which data can be collected, such as by surveys or direct observation. In the resulting data set of indicators, we provided suggested data sources for all indicators.
- **Definition**: Overall, there was some ambiguity in the measures, which could result in data quality issues if communities interpret indicators differently. We added some additional clarity to indicators to provide at least a one-sentence definition. For example, under the topic of Housing, an indicator might have been listed as “census data,” so we added typical census housing data for clarification (e.g., number of rentals, number of owned houses, occupancy, single-family owner occupied). In addition, some indicators, such as third grade reading comprehension, might not seem related to land reuse and redevelopment, so we added the explanation, “Important in areas with multiple older buildings that may be vacant and painted with lead-based paint or in areas of high disinvestment, which can impact school quality.”

Results

After the final consolidation, we had a set of 69 public health indicators associated with land reuse and redevelopment that are commonly being tracked by at least 20% of the 40 Action Model communities. The final grouping of indicators selected by communities fell under 9 community health categories:

- Built Environment: 17 indicators
- Community Involvement: 4 indicators
- Economy: 16 indicators
- Education: 4 indicators
- Environmental Improvement: 6 indicators
- Environmental Resources: 5 indicators
- Housing: 11 indicators
- Physical Health: 4 indicators
- Safety and Security: 2 indicators

For communities considering ways to track implementation of activities and changes over the course of revitalization, the indicators provide a variety of measures to contemplate. Ideally, communities may wish to select a handful of indicators from categories that best resonate with their particular community concerns, redevelopment activities, intended outcomes, and stakeholders.

The 69 indicators are provided, organized by health categories, under the ATSDR Build Your Own Community Health and Land Reuse Scorecard Toolkit at www.atsdr.cdc.gov/sites/brownfields/model.html. An example highlighting environmental improvement and community involvement indicators is provided in Tables 1 and 2.

Discussion

We created the Action Model to help communities measure overall changes in community health over the course of redevelopment. By consolidating the indicators derived by 40 communities to track such changes, we aim to provide additional guidance to assist communities in selecting indicators that might help them address redevelopment concerns and improve health outcomes. While we limited our 69 indicators to those collected by at least 20% of 40 different communities, we recognize that communities may be interested in indicators that are not part of ATSDR's community-derived set of indicators.

Our indicators can be used for guidance but communities can also consider measurement and evaluation in the context of their own stakeholders and intervention design. Communities may wish to create their own indicators that demonstrate their unique concerns. For example, one community was concerned about how odor from a waste transfer facility affected residents' quality of life. This indicator was very specific to one community but it was still very important to that community and its intervention design. One resident ultimately conducted a survey of residents and businesses near the waste transfer facility and quantified quality of life impacts from waste odor, which helped move forward the eventual relocation of that facility to a more compatible area.

To provide additional Action Model indicator development guidance from a real community, we provide an example from Baraboo, Wisconsin, a community highlighted in Berman and Forrester (2013). Table 3 highlights the various measures the Baraboo Development Community derived and tracked over time. The full set of Baraboo's indicators is available and described in the report, *Community Health Monitoring: The Baraboo Ringling Riverfront Redevelopment* (www.atsdr.cdc.gov/sites/brownfields/docs/Final_Baraboo_032911.pdf). Ultimately, within a few short years, Baraboo began to measure positive outcomes by tracking their indicators, including a 40% reduction in potentially hazardous sites and exposures to contaminants (indicators related to pollution of the river and sites) and increases in new jobs and contribution to the tax base (indicators related to community-wide employment, business, and economic issues). Highlights are provided in the sidebar above.

Conclusion

The community-derived public health indicators associated with land reuse and redevelopment provide a useful accompaniment to the Action Model and serve as a promising tool for communities to track the delivery of activities and changes in overall health status over the course of redevelopment. Indicators mark progress and can support performance measurement and evaluation, increasing the opportunities for continuous program improvement and measuring change in environmental and general health outcomes. ATSDR's compilation of public health indicators will provide a helpful resource for communities to track their progress.

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References

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Action Model Indicators Example

Baraboo, Wisconsin, an Action Model community, tracked environmental, health, housing, and other community-focused indicators over the course of a riverfront redevelopment. Baraboo tracked several outcomes within a few years of redevelopment plan implementation. These outcomes included the removal, remediation, or redevelopment of 4 of 10 (40%) land reuse sites, which reduced and removed potentially harmful contaminant exposures for more than 500 nearby residents. Redevelopment of land reuse sites also added 15 new jobs and increased the tax base by $3 million. The Baraboo case story is available in the Agency for Toxic Substances and Disease Registry's Land Reuse Toolkits for municipal agencies at www.atsdr.cdc.gov/sites/brownfields/land_reuse_toolkits.html.

TABLE 1

Community Involvement Indicators

Indicator	Definition	Data Source
Number of city/community events and meetings	Count/number of events and meetings related to redevelopment	• Event/meeting flyers or agendas • Internal county/city/town or nonprofit data
Participation rates in city/community events and meetings	Number of people participating in events and meetings related to redevelopment	• Sign-in sheets • Internal county/city/town or nonprofit data
Number of public/outreach documents (e.g., publications, flyers, and readership statistics)	Count/number of public/outreach documents created related to redevelopment	• Number of publications, flyers, and/or infographics that are distributed or counted by web hits • Internal county/city/town or nonprofit data
Type of public/outreach documents (e.g., publications, flyers, and readership statistics)	The description of public/outreach documents created related to redevelopment	• Examples of publications, flyers, and/or infographics that are distributed or counted by web hits • Internal county/city/town or nonprofit data

Note. These indicators measure the implementation of community outreach and involvement activities to populations of interest associated with land reuse and redevelopment activities.

TABLE 2

Environmental Improvement Indicators

Indicator	Definition	Data Source
Inventory to characterize land reuse sites (e.g., brownfields, cleanup sites, and under-used or polluted sites) through a public health lens (e.g., size, sensitive populations, frequency of access, etc.)	The description of land reuse sites in a community from a public health/exposure perspective	• Agency for Toxic Substances and Disease Control Site Screening Tool: www.atsdr.cdc.gov/sites/brownfields/site_inventory.html • Internally generated inventory, such as a spreadsheet maintained by a city
Pre- and post-redevelopment list of contaminants at sites	The list of contaminants suspected or confirmed to be at sites before and after redevelopment	• Internal county/city/town or nonprofit data
Pre- and post-redevelopment media impacts (e.g., air, soil, water, etc.)	The environmental media, such as soil, air, water, or sediment, that is suspected or confirmed to be impacted by chemical contamination before and after redevelopment	• Internal county/city/town or nonprofit data
Pre- and post-redevelopment levels of contamination	The quantitative levels of contamination measured in environmental media before and after redevelopment (e.g., soil lead levels in ppm)	• Internal county/city/town or nonprofit data
Number of lead abatements/remediations	Number of lead abatements or remediations that occur during redevelopment, such as the removal of lead-based paint from a structure slated for reuse	• Internal county/city/town or nonprofit data
Number of asbestos abatements/remediations	Number of asbestos abatements or remediations that occur during redevelopment, such as the removal of asbestos-containing material from a structure slated for reuse	• Internal county/city/town or nonprofit data

Note. Environmental improvement indicators measure the implementation of activities and achievement of outcomes related to hazardous chemical reduction.

TABLE 3

Baraboo, Wisconsin, Land Reuse and Redevelopment Indicators

Issue	Measure
Environment	
Pollution of the river	Water quality
River preservation	Site inventory, stormwater ordinances, pollution prevention practices, sewer system parameters
Sites	Site inventory, status of sites, health consultations/technical assists
Landscape and vegetation	Vegetation survey
Odor and rodents	Odor survey, rodent control data
Habitat concerns	Wildlife survey, environmentally-friendly lighting, habitat preservation
Land use/reuse	
Neighborhood design	Sidewalks survey, trails survey, green/open spaces, businesses/services, design techniques/standards, housing types, pre-1978 housing and commercial units, lead and asbestos remediation, demographics, community pride and satisfaction
Incompatible land uses	Description of incompatible land uses
Community-wide employment, business, and economic issues	Young families, births, college educated residents, tenants, businesses, people shopping/dining, economic statistics, school district and real estate data, people using parks (young people in the area)
Riverfront access and linkages to complement and connect the downtown square development	River access, trails survey, recreational activities, river walk and linkages
Safety/security/health	
Security of worksite during redevelopment	Site access, extra patrol
Poor condition of sidewalks	Sidewalks survey
Security of river trails	Surveillance and accident log
Communication/risk communication	
Continued partnership between city, public health, state, and residents	Partnership activities, city and health department education and outreach activities
Communication of hazards	Partnership activities, number of lead-poisoned children