



Elkhorn Lake Improvement Project

Health Impact Assessment

Kentucky River Area Development
District and the City of Jenkins, KY

Elkhorn Lake Improvement Project



Elkhorn Lake Photo by Jeremy Potter, 11th Grade Jenkins High School

“The Elkhorn Lake provides a beautiful area for the residents of Jenkins and surrounding areas to enjoy. This park swing can be used to enjoy a meal and watch the local geese commune in the waters. The scenery and wildlife are exquisite to this area and are great places to relax and walk around.”

Kentucky River Area Development District
941 N. Main Street
Hazard, KY 41701
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Acknowledgments - Workgroup Members and Stakeholders

Thanks to all those who worked so hard to complete this Health Impact Assessment.

Todd DePriest, Project Director for Elkhorn Lake Project; Mayor, City of Jenkins; Role: Elkhorn Lake Project Leadership and final decision maker for city

Roger Profitt, Jenkins Resident

Eileen Sanders, Jenkins Resident

Stacy Collier, Jenkins Independent Schools

David Mathews, Ph.D., KRADD HIA Project Director; Role: Project Leader for the Health Impact Assessment aspect of the Elkhorn Lake Project

Donna Hardin, M.B.A. KRADD HIA Project Coordinator; Role: Coordinator and lead communicator for HIA project

Karen Back, Workgroup Member: Program Manager; Kentucky River Regional Prevention Center; Role: Research and analysis

Scott Lockard; Workgroup Member: Kentucky River Area Health Department Director; Role: Technical Advisor research and analysis

Bennie McCall; Workgroup Member, City Administrator; Role: City government

Angie Raleigh; Workgroup Member: Breathitt Health Department Director; Role: Technical Advisor and analysis

Melissa Slone, M.S.W. Workgroup Member: University of Kentucky Center of Excellence in Rural Health; Role: Liaison with rural health community

Cale Turner, Workgroup Member: Owsley County Judge Executive; Role: Technical analysis

Other Stakeholders and Advisors

Jimmy Dills, MUP, MPH, Technical Advisor: Georgia Health Policy Center; Role: Technical Assistance provided through Health Impact Project

Paul Nesbitt, PE Project Engineer: Nesbitt Engineers, Lexington, KY Role: Engineer for city and technical expert on all matters related to dam and lake rehabilitation and reconstruction

Emily Bever; HIA Project Funder: Senior Associate, Health Impact Project; Role: Lead contact for HIA project Elkhorn Lake Project

Gail Brion, Ph.D., University of Kentucky, School of Engineering/Department of Civil Engineering, College of Public Health/Department of Environmental Health

Jonathan Heller and Logan R. Harris, Human Impact Partners is a resource provided by the Health Impact Project

Michelle Allen, Executive Director, Kentucky River Area Development District

Angela Hall, Associate Director, Kentucky River Area Development District

Michael Miller, Former KRADD Executive Director

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ELKHORN LAKE IMPROVEMENT PROJECT

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EXECUTIVE SUMMARY

In January 2018, Kentucky River Area Development District (KRADD) was awarded funding to conduct a Health Impact Assessment (HIA) on a project in southeast Kentucky. Following the normal HIA process screening, KRADD focused on the public policy initiatives in the area of its jurisdiction. This Health Impact Assessment (HIA) focuses upon planned improvements to the Elkhorn Lake reservoir, dam, and park in Jenkins, Letcher County Kentucky. The city officials' rationale for the improvements is for improved drinking water, public safety and recreation. The HIA looks at the social determinants of health and relates them to the planned community changes made by the policy makers. The health impact recommendations from this study were grouped into five major categories: Overarching for Jenkins and KRADD, Dam Safety, Water Quality, Park Amenities and Community Development.

OVERARCHING RECOMMENDATION: JENKINS COMMUNITY RESILIENCE

The overarching recommendation for Jenkins is to utilize the local community residents, led by a group of community leaders, to develop a resilience plan for Jenkins. The Elkhorn Lake Improvement Project (ELIP) goals are necessary and worthy, but relying on external entities to solve the problems in Jenkins is a poor strategy for progress. A large grant from a major government source appears unlikely as an all-encompassing funding mechanism. However, lesser changes, and consequently those “low hanging fruit,” could be identified and acted upon more quickly with individualized funding mechanisms from local and external sources.

This ELIP Health Impact Assessment could be fodder for the Community Resilience Plan team. The social, health and economic indicators shown here could become useful for developing the Jenkins Community Resilience Plan. Transformation of a city beset with a wide variety of challenging issues will not be easy or fast, but it can be done with persistence and belief in the power that resides within the community to control its own destiny. Jenkins can demonstrate to its residents and the region that the city has a new vision for the future, including a culture of health and prosperity. Promoting health and a hopeful, positive outlook will make the residents and city more attractive and easier to market to investors and potential employers.

WHAT DOES ALL THIS MEAN FOR KRADD?

KRADD has the opportunity, through its network of members, to provide leadership and training to create a new future for the region. Looking at all available indicators of health, economy, social factors and community for Letcher County and all the KRADD counties shows many challenges—so many, in fact, that it appears daunting. Overcoming this apparently overwhelming variety of challenges requires transformational leadership and transformational change. Leadership and community change must come from within Jenkins to meet its residents' needs. KRADD could use its membership forum to learn how to develop resilience plans for their communities. Rather than simply economic development, these plans would expand the definition of community development to include resident health, economic development and development of a more involved community. Training current and

future community leaders and other key players or stakeholders in Building Community Resilience, Health in All Policies, and Community Engagement could, over time, lift southeast Kentucky out of the doldrums it now faces. Many small change projects will gradually overcome the plethora of challenges. As a wise one said when asked how to eat an elephant, “One bite at a time.”

So, where does one begin? Examining the existing community development models in detail discussed briefly here and then selecting aspects that KRADD could bring to the forefront in southeast Kentucky would be a start. Looking at the “Health in All Policies” approach embedded in the Health Impact Assessment tool would guide the chosen community development approach. This broader health approach guides policy makers to keep from simply targeting the economy. Creating a strong, healthy community where *feel good and want to work and live* is the mission.

GUIDING PRINCIPLES FOR COMMUNITY DEVELOPMENT

Consider this set of guiding principles as a basic framework:

1. Use a definition of community development that goes beyond housing and jobs to include health and resilience;
2. Create incentives for developers to have a broader community perspective that includes health;
3. Empower more local persons to be active community leaders;
4. Support ideas that reflect increased internal cognitive controls;
5. Recognize changing roles for men and women without demeaning anyone;
6. Support resilience in children and the community;
7. Engage the community institutional leaders in the process;
8. Develop local policies that reflect local challenges and priorities;
9. Revitalize downtown areas and make the community more attractive;
10. Create attractive communities are places where people *feel good* about living there.

HIA RESEARCH ISSUE 1 - DAM SAFETY AND HEALTH

Since 1912, the dam has deteriorated, with seepage from the dam face constant and increasing. At the time the dam was constructed, the coal company likely did not know that the dam was in an earthquake zone with an earthquake fault running directly through it. Since the Elkhorn Lake Dam's construction, there have been hundreds of small quakes in the area, which have increased the dam seepage but have not caused a breach. The Kentucky Division of Dam Safety has rated Elkhorn Lake as a High Hazard dam with its condition rated as Poor. When constructed, the dam's design called for pipes to penetrate the base of the dam to supply water to a hydroelectric plant and spillway at the top of the dam to release pressure on the dam during flood conditions. Over time, these efforts to control hydrologic pressure on the dam have become ineffective. Any heavy rainstorm causes the lake waters to overtop the dam. Overtopping is a condition attributable to a large share of dam failures worldwide. If there were a dam failure, several hundred lives could be lost if no warning and evacuation occurred.

FINDINGS – Because of the possible structural deficiency, the presence of the frequent low-level earthquakes in the area, and the increased geologic instability, Emergency Action Plans need to be devised to prevent potentially catastrophic consequences for which the community is not currently fully prepared.

The KRADD HIA team along with the assistance of the Jenkins Mayor and residents developed these recommendations in response to the findings from the assessment. Because the water is a valuable community resource to preserve and protect health, the following recommendations are made:

RECOMMENDATION 1.1 - Community organizations such as volunteers, fire, police and emergency management play a role in preventing disasters. The ability of some communities to prevent disasters and mitigate the impact of disasters has declined, as traditional communities have decreased, and younger people have left the area seeking employment. Older adults and persons with physical and mental disabilities have increased. To prevent loss of life due to a dam breach disaster, it is necessary to make local disaster prevention efforts a priority and an ongoing occurrence. The public as well as the governmental authorities need to participate and cooperate to protect their communities. Their efforts should be reflected in city administrative planning. In order to find ways to involve local residents in disaster prevention, city officials, fire department and police must develop an alert mechanism, conduct drills with evacuation exercises, engage in ongoing prevention education activities and offer provisions for the transportation of local residents to safety as required components of disaster preparedness activities.

FINDINGS - Some of the recommendations of the dam inspectors have been repeated from report to report. Close compliance with the inspector's recommendations could improve structural integrity of the dam, help reduce community stress and increase public confidence in the city's preparedness.

RECOMMENDATION 1.2 - The City of Jenkins is encouraged to follow the recommendation of prior dam inspectors and engineers: to routinely manage and maintain the dam face, and as soon as possible, rehabilitate the discharge pipes to relieve pressure on the dam at times of flooding. Improving the maintenance, brush control and debris located in the public works area below the dam could decrease erosion and increase public perception of the city's attitude toward safety and prevention. In addition, the city needs to begin closely monitoring the dam for overtopping, cracks or increased seepage by at least two persons every day as recommended by dam inspectors^(1,33). These steps could help reduce community stress and increase preparedness. In other words, prepare for the worst and hope for the best, until resources become available to perform the major safety improvements.

HIA RESEARCH ISSUE 2 - WATER QUALITY AND HEALTH

Public trust in the drinking water supply is a major hurdle to overcome around the world because of declining water quality. Even when the tap water is clean and pure, customers may choose less healthy alternative or rely on bottled water. Water department tests show high levels of hydrocarbons from 1996-1999. More recent water quality tests show repeated violations for a variety of contaminates. Water quality could be improved, and the possibility of selling more water to nearby water districts

could produce more income for the city and stave off summertime drought. The dredging of Elkhorn Lake would remove the water lilies and their roots so the plants would not regrow, thus increasing the capacity of the reservoir water to more than the 300 acre-feet the lake is currently rated. Dredging the lake is estimated to cost over \$1 million, and it would require draining the lake for months, causing the city to have to purchase all its water and pump it to the city. This expense may be unreachable because of competing funding priorities within the city and competition for external funding sources. Furthermore, the dredging would unearth the estimated thousands of yards of buried sediments that potentially contain pockets of naturally occurring heavy metals. All sorts of contaminants have possibly accumulated in the lakebed over the last century, although there is no local test evidence to support this possibility. More health-related damage may be due to substituting sugar-sweetened beverages for plain tap water because of misperceived poor water quality or mistrust of the water than by toxins or contaminants in in the tap water.

FINDINGS – Public perception of the water quality and trust in the water safety’s importance to health outcomes cannot be overstated. Choosing harmful drinks such as sugar-sweetened beverages as substitutes for water may cause many health conditions. Removing the water lilies and other unwanted debris and vegetation from the lake would improve the water quality. The health benefits of taking less drastic steps than dredging are preferable to waiting until enough funding for dredging become available. The water lilies and debris removal from the lake could be performed with modern technology designed for this purpose. Water quality violations have resulted from missed scheduled testing and required notifications to the consumers.

RECOMMENDATION 2.1 - Developing mechanisms for improved community monitoring and frequent consumer notifications about water quality and safety would also likely result in improved public confidence in the water quality. The improved public confidence in the water quality would have the added benefit of improved public health from increased drinking water consumption rather than other less healthy beverages.

RECOMMENDATION 2.2- Creating a community-based organization such as a *Friends of Elkhorn Lake* group comprised of local residents and students to assist the city with communications about water quality improvement planning and lake clean-up activities would have the added benefit of mobilizing the community to take action in managing the water lilies and clearing debris from the shorelines. This Friends of Elkhorn Lake group could become an advocacy group for the city to obtain the funding needed for dredging and other major improvements and assist with lake monitoring and disaster prevention activities.

HIA RESEARCH ISSUE 3 - PARK AMENITIES AND HEALTH

The Elkhorn Lake Park area in Jenkins consists of a few park benches along the water’s edge, a boat ramp, a small pier, playground equipment, picnic area, swimming pool, softball field, and restaurant. Mayor De Priest ^(2,9) would like to expand the park by providing a walking trail around the entire lake. The lake is situated as a focal point for the city. There exists a large volume of scientific literature on the community benefits of urban or neighborhood parks such as at Elkhorn Lake, if they include a

variety of features. The social determinants of health such as physical activity levels, stress relieving recreation, social interactions and healthy lifestyles would improve the overall health behaviors and longevity of the people of Jenkins. The literature reviewed demonstrates a growing body of evidence supporting the idea that many aspects of the built and social environment can impact health behaviors and outcomes. Public parks are among the most common places for outdoor physical activity, which improves health.

FINDINGS – Health behaviors can be improved through the utilization of a park and its amenities.

RECOMMENDATION 3.1 - The community and City Council should work with the local health department to increase awareness of the health effects of an improved park and the amenities offered by utilizing the Surgeon General’s Call to Action to promote walking and walkable communities.

FINDINGS – The improvement of park amenities would increase the health behaviors of those utilizing Elkhorn Lake Park.

RECOMMENDATION 3.2– While the data shows promise for health benefits by the expansion of a park walking trail, and the cost of a walking trail around the entire Elkhorn Lake has been incorporated in the Abandoned Mine Lands applications, these improvements have not been considered as an individual project. City leaders should consider separating various components of the Elkhorn Lake Improvement Project and plan other funding mechanisms or grant opportunities to strategically improve amenities in the park. Community engagement and mobilization are key components park to improvements. The proposed Friends of Elkhorn Lake could be key to this mobilization.

HIA RESEARCH ISSUE 4 - COMMUNITY DEVELOPMENT AND HEALTH

The people of southeast Kentucky see new opportunities for community development as paramount. If a goal is to create a culture of health in Jenkins and Appalachia, fostering community engagement and economic development must be a part of it. Some see reluctance by many central Appalachians to participate in the democratic process to create increased prosperity. One accounting of the Appalachian cultural sociology, based on the colonization of the coal camps by international owners, was described as Power and Powerlessness, and another as the failure to develop a strong sense of civic responsibility. The community development researchers and theorists reviewed here understand that overcoming poverty is an essential component of health promotion and community development. The review of the community development literature includes diverse sources such as the AARP, the EPA and the ARC as well as Australian sources. Common themes to building community resilience from U.S. and international sources are community engagement and community pride. Health promotion theorists have attributed some adult health problems and lack of social adjustment to adverse experiences in childhood caused by family stress and poor community environments. The research conducted for this HIA supports building community resilience along with strategies to engage the community in development plans with the result being healthier people and more prosperous communities.

FINDINGS - Models for community development presented include health as a key component, but they also call for engagement of the civic ecosystems or major institutions in the process. These institutions such as banks, churches and health care agencies should provide leadership to improve civic participation. A Mississippi journalist said it best when he wrote *“Frills No Longer”* in describing community development. The journalist contended that today, jobs come to where the workers choose to live rather than workers going to distant jobs. The workers choose where they live by *how they feel* about a place. With the long history, traditions and culture of Appalachia, people love the land they have worked so hard to build. They do not want to leave their family and community just for a job where they might have long commutes daily or on weekends. Making communities attractive to workers and businesses leads to improved quality of life and better health outcomes.

RECOMMENDATION 4.1 - The City of Jenkins’ leaders and other community leaders need to undertake a program of civic engagement that clarifies and sets priorities for the city. The city needs to conduct a strategic planning process that clarifies the major goals for the city and actions to take in the near term, but which also looks at the overall needs. The city should concentrate on what the residents could accomplish themselves without depending upon outside assistance or funding. This kind of grassroots initiative would strengthen the community and make it a healthier place to attract new opportunities in the long term.

RECOMMENDATION 4.2 - The City of Jenkins should make the Elkhorn Lake Improvement Project the first component in a series of local improvements to make it more attractive to residents and businesses. A team of residents, formed as an action committee, would identify which priority steps must be taken to improve the dam, park, and water quality, while creating Jenkins’ ownership of the actions. Involving the city government, banks, churches, schools and businesses in identifying their individual and collective parts will help assure success.

Collectively, these recommendations would not only improve the community safety, reduce stress, improve water quality, build upon a beautiful centerpiece for the city and make the city more attractive for development, but would also deliver the added benefit of creating a more hopeful community spirit.



Background of Elkhorn Lake Project

In January 2018, Kentucky River Area Development District was awarded funding for a Health Impact Assessment. A Health Impact Assessment (HIA) is an examination of a proposed public project possible health impacts for southeast Kentucky. The eight coterminous counties of Breathitt, Knott, Lee, Leslie, Letcher, Owsley, Perry and Wolfe comprise KRADD's southeast Kentucky planning region. Within Kentucky, groups of counties are organized to promote common economic development goals and undertake projects collectively and individually that any county alone may not be able to accomplish. Annually, KRADD publishes a Comprehensive Economic Development Strategy (CEDS)^(1.0) to inform the Kentucky Department for Local Government and other entities of these activities. Since all local elected officials are on the KRADD Board of Directors the CEDS provides them with a means of communicating their local development goals and work together on shared goals.

The KRADD region has many challenges including a lagging economy, high disability rates, decreasing population and failing industries. Many state and national reports of the KRADD region rank residents' health among the lowest in many categories. Coal mining served the region as the economic engine of the past century. Now as mining industry employment declines, developing a more diverse economy becomes paramount. The KRADD counties are mountainous, making infrastructure development more challenging. Projects such as road and bridge construction, public water systems and wastewater treatment become more expensive, though a priority. All counties seek to improve the quality of life for its residents while finding new ways for progress and employment. Recent efforts have also focused on tourism for the area since the mountains provide a recreation destination for the adventurous traveler.



The Health Impact Assessment (HIA) for the Elkhorn Lake Improvement Project informs the City of Jenkins, (see location on map) and the Kentucky River Area Development District, Inc. and its Board of Directors, on the health impact of their policy decisions. Elkhorn Lake is not just a reservoir for the city's water supply; it also impacts upon the entire health, social and economic development of the community. Quality water is the most essential building block for an individual's survival and a community's ability to prosper and grow. The City of Jenkins plans a major upgrade to the lake, dam and surrounding park land. The initial goal of the Elkhorn Lake Improvement Project was to

improve the reservoir capacity, improve the structural integrity of the dam and landscape around the dam and reservoir. This HIA seeks to emphasize additional environmental and social health determinants as priority goals. Paul Nesbitt, the City Engineer for Jenkins, and Mayor Todd DePriest has long sought Elkhorn Lake improvements as a matter of public health and safety^(1.1).

HOW DOES THE HISTORY OF JENKINS, KENTUCKY INFLUENCE THE HIA?

Jenkins, Kentucky was carved out of 100,000 acres of the southeast Appalachian mountain wilderness by the Consolidation Coal Company in 1911. Consolidation Coal purchased the area to mine the plentiful coal where Kentucky, Virginia and West Virginia converge. Jenkins thrived for half a century partly because the coal company-built Elkhorn Lake, made possible by constructing a 40-foot-high dam on Elkhorn Creek. In 1956, Consolidation Coal sold its interests to Beth Elkhorn Corporation when the gradual decline of the mines had begun. Jenkins, with a population of over 2,300, is unusual because it did not develop as a town gradually, but it was constructed entirely as a coal camp for the miners who worked in the underground coal mines below Jenkins. Elkhorn Lake, which sits above the City of Jenkins, has changed little since Consolidation Coal built it in 1912. The 19th-century dam construction standards used for the Elkhorn Dam do not compare favorably to the 21st-century standards. However, the dam was well constructed using concrete and steel, as shown in the 1912 photo shown here. This concrete and steel construction produce stronger dams compared to many existing earthen dams.

Construction of Elkhorn Lake Dam in 1912 showing Concrete and Steel Skeleton



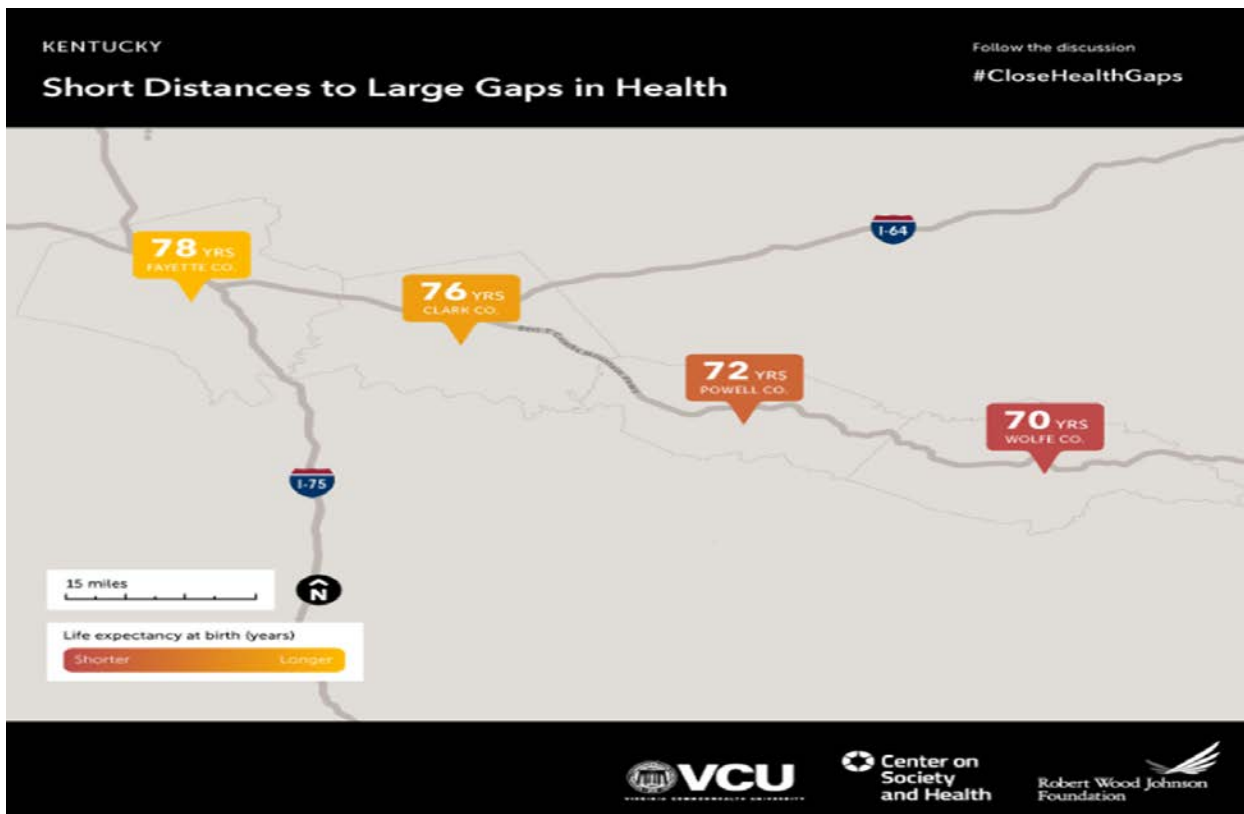
Now, fierce torrents cause dam overtopping during heavy rainstorms and the ongoing water seepage on the dam face is a growing matter of concern. The relief pipes through the dam base that were created to supply water to a long-gone hydroelectric plant are now dysfunctional crumbling derelicts. In addition, potentially noxious vegetation and possibly toxic sediments from the upstream surface mines may have contaminated the reservoir over the past 106 years. This Elkhorn Lake history is important to this HIA because: 1) The history explains how the current health and safety challenges developed in the city and 2) The single industry nature of the town's development from its inception has contributed to some serious health challenges, which require a broad-based approach to address thinking about the public health. The HIA tool promises an approach to this project, which appears fruitful.

Since 1965 when the Appalachian Regional Commission (ARC) was created as part of the "War on Poverty" to foster economic development and alleviate poverty, there have been concerted efforts to diversify the region's economy. Regional development districts such as the Kentucky River Area Development District were formed from similar contiguous counties. Along the way, the community

development emphasis became concentrated on jobs, with health care providing a large share of the new workforce.

Recent decades have seen the focus shift to developing leadership with the skills and motivation to lift communities out of poverty and foster new housing developments and educational opportunities. The lack of economic diversity and extreme family distress has made Appalachia fertile ground for social and health problems. The attention of local public health authorities has become focused on a series of crises with hepatitis, measles, addiction and other diseases stretching already depleted resources.

While steep mountains and dense forests have provided the industrious people of Appalachia with an economy for generations, these same mountains and forests have contributed to the barriers for new community development. Basic infrastructure such as roads, bridges, water and sewer projects are more challenging and expensive in the narrow, steep and rocky terrain of Appalachia. The mountains also create barriers to communication for educators and the political leadership. Travel for schools, community meetings and access to health care requires reliable transportation. In Jenkins, communications are also constrained by the lack of a local Jenkins newspaper, TV stations or even radio stations. The Appalachian history of deadly conflicts through clan feuding, union versus company feuds and geographic isolation has contributed to a lack of trust locally, reticence for community engagement and a malicious stigma nationally. As important as stakeholder engagement is to community development, these communication barriers become another giant obstacle for local leaders to overcome.



Recognizing these historical barriers to development, ARC and its member states and counties have examined health disparities in the region versus other parts of the United States. In August 2017, collaboration among the ARC, Robert Wood Johnson Foundation, the University of North Carolina, the Foundation for a Healthy Kentucky and PDA, Inc. produced a report called *Creating a Culture of Health in Appalachia*^(1,4). This overall Appalachian area health disparities report revealed performance on 33 of 41 health indicators in the Appalachian Region as worse than the performance in the United States as a whole. The Appalachian Region's number of physically unhealthy days, mentally unhealthy days and prevalence of depression are all higher than the U.S. rates. Obesity, smoking, physical inactivity and risk factors for several health outcomes were higher in Appalachia than in the nation overall. These health outcomes lead to a shorter lifespan than even other parts of Kentucky as the research graphic above by Virginia Commonwealth University shows.

Process for Selecting the HIA

The HIA team followed the six-step process for conducting an HIA depicted here. The first step is the screening process, which began with the KRADD document called the Comprehensive Economic Development Strategy (CEDS). This document outlines all the major projects planned for the region. Yet the CEDS has not concentrated on improving health as a priority for the region. Introducing HIA into the southeast Kentucky region's planning process presents a promising approach for examining community health as an important part of economic development strategies.



The 2018 CEDS document lists approximately 60 local and regional development projects within the eight counties. These CEDS-listed projects change constantly, as some are completed and others are adopted, abandoned or postponed as new priorities emerge. Some projects associated with elected government officials may become discarded by a succeeding administration. Projects may be abandoned because there is a lack of funding, little public support, changing costs or changing market conditions. Selecting a project for the HIA becomes

complicated for all these reasons. Plus, the decision is complicated by factors such as do whether to concentrate on a municipal, county, regional, federal or state project, or a public or private sector development project? Using the HIA screening process helps the framing of priorities as inclusive of potential impacts on health (in addition to the ones noted here). The promise of the HIA approach also helps achieve longer term goal of reducing health inequities and disparities.

To assist in this screening decision making process, tools were selected and modified by the KRADD HIA workgroup. The Technical Assistance Advisor provided by Pew, James Dills, offered an Excel spreadsheet for our use. The screening worksheet had about a dozen questions for analyzing each CEDS project and the workgroup added a few more questions. The workgroup examined each project

with each question. The result was a numerical value assigned to the item and calculated a total score for each project. Based upon this screening process, the workgroup narrowed down the type of projects into three categories: parks, water or wastewater projects. The workgroup added questions concerning project financing status, support from leadership and the potential for regional or local impact, which social determinants are potentially addressed and whether project start and completion dates were within estimated timeline. The workgroup discussed each of the screening items in turn for each of the listed 60 projects. The potential aspects for each item:

- *Are there substantial effects on public health, particularly those effects that are avoidable, involuntary, adverse, irreversible or catastrophic?* We discussed how water quality and availability affect health, sanitation and hygiene.
- *Are there unequally distributed impacts?* We believed that the health impacts may impact persons in the city and county.
- *Does the project impact on populations with poor health?* We saw clear impact on persons living downstream from the dam, and upstream water quality impacted upon community health.
- *Stakeholder concerns about a decision's health effects?* The workgroup believed that support from the local leadership was a major factor in the likelihood of project success.
- *Would the HIA add new information that would be useful to decision-makers?* The workgroup thought that the HIA process could add documentation for the project need and improve the project design by further designing the recreational aspects of the reservoir.
- *Would the HIA result in timely changes to a policy, plan, program, or project?* We believed that the project was early enough in its development that we could make recommendations that would improve community health and safety.
- *Is there the availability of data, methods, resources, and technical capacity to conduct analyses?* The community mayor provided the workgroup with correspondence, engineering reports and water quality test reports.
- *Are there available, alternative opportunities or approaches to evaluate and communicate the decision's potential health impacts?* The workgroup discussed other potential ways of framing the project application, which would heighten the awareness of the health issues and the safety for community residents.

ARRIVING AT PROJECT SELECTION DECISION

After much project review and discussion, the workgroup selected water projects as the general category and the water project in Letcher County in particular. The water reservoir project in the city of Jenkins (Elkhorn Lake Improvements Project) is the primary HIA target. This HIA analysis strived to identify health-related strategies that improve the Elkhorn Lake project design and help improve water quality, recreational opportunities, environmental hazards, economic development and overall quality of life in the community. Since 1986, the city of Jenkins municipal water supply comes from the Elkhorn Lake. The Elkhorn Lake dam needs repair to prevent erosion, improve dam safety and prevent

further leakage. Kentucky Dam Safety has ranked the Elkhorn Lake Dam as a High Hazard, meaning structures are located below the dam such that failure may cause loss of life or serious damage to houses, industrial or commercial sites, public utilities, main highways or railroads.

While some other projects scored higher using the initial scoring by the workgroup, the multi-faceted nature of the Jenkins Elkhorn Lake project made it the most attractive. The workgroup, which included the Mayor of Jenkins, thought that having the strong support of the Mayor was a major advantage to the HIA. In addition, the Jenkins Mayor, formerly KRADD Chairman, is highly regarded by the KRADD staff and its board of directors. The Jenkins project touched upon several issues that the other project did not. While a water project it is also a safety project because of the dam's age and condition, Elkhorn Lake is a public safety project, a water quality project, a recreational development project and an economic development project. The Elkhorn Lake project calls for approximately \$2,800,000 in improvements as currently designed. Additional alternative sources of funding may be sought by KRADD and by the City of Jenkins.

Research Plan for the Elkhorn Lake Improvement Project

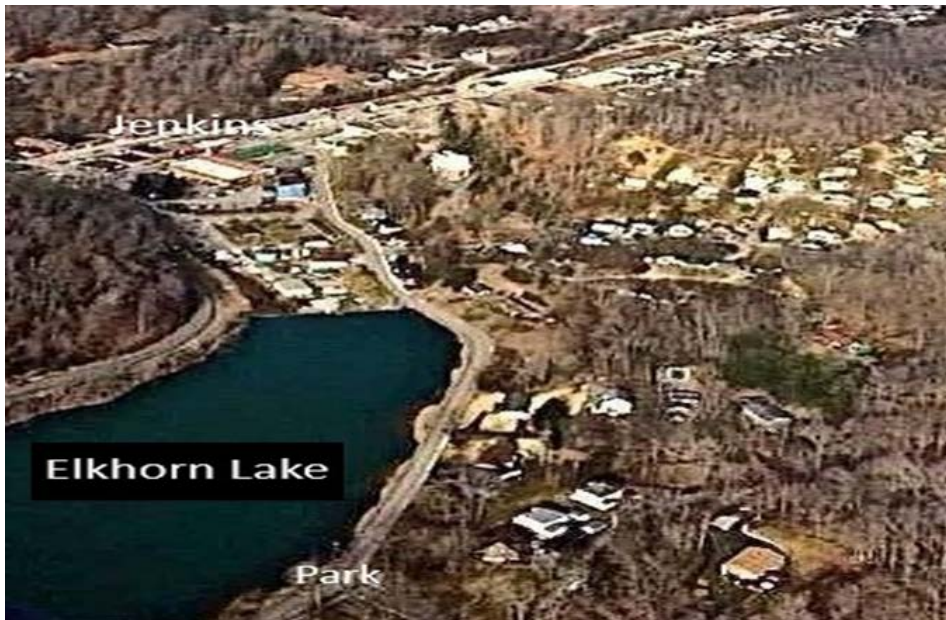
The County Health Rankings lists health, social and economic factors and ranks each state and their counties. While Kentucky ranks 45th of the 50 states, the KRADD counties rank from 104/120 or lower. The district has low education rates, high unemployment rates, high child poverty rate and low household income rates.

Jenkins, Kentucky has a proud tradition in the coal mining industry that extends over 100 years. Jenkins motto is "*A City Built on Coal.*" This phrase is apt because in 1912, a coal company bought the surrounding 100,000 acres and constructed the city along with Elkhorn Lake, the city's park and dam. Since then, Jenkins has used the lake as the water reservoir to serve its community. Presently, the city and its residents are challenged by multiple determinants to their health and well-being. Now, Elkhorn Lake's contents and the dam's structural design and integrity pose a threat to this community's people while remaining a vital resource. Jenkins also has challenges to its economic, environmental and social health. Collectively, these health determinants are known to produce shorter life expectancy and serious health conditions. According to city documents, the Elkhorn Lake Improvement Project would retain a total of 34 jobs with the City of Jenkins, four of which are in the Water and Sewer Department.

The City of Jenkins sells water to the Letcher County Water and Sewer District and is connected to the Fleming Neon Water and Sewer District and Pike County Water and Sewer Department. The loss of this water source would have damaging effects on the four water districts as well as the City of Jenkins, which is situated below the reservoir. An example of an event, which could amplify the weaknesses in the dam structure, is the situation that occurred in November 2012 when a 4.3 magnitude earthquake was centered near Blackey, Kentucky just 32 miles from Jenkins. Tremors from this quake, which occurred in the Pine Mountain Overthrust Fault, were felt as far away as Columbus, OH, Atlanta, GA and Tennessee.

GEOGRAPHICAL AND TEMPORAL BOUNDARIES FOR HIA

The city of Jenkins, Kentucky proper and area surrounding the city in Letcher County, Kentucky is the geographic area in the study. The demographics of Jenkins and Letcher County residents are homogenous racially and ethnically. The population is aging and slowly shrinking because the coal mining-based economy, poverty, education challenges and disabilities limit local opportunities. While the HIA began in January 2018 and extends into the fall 2019, the potential health impacts extend through the next decade. As a small town in a small county, the availability of health indicators is limited due to statistical sampling restrictions. The aerial photo below shows Elkhorn Lake, Dam and Downtown Jenkins, KY.



The ELIP plans and decision alternatives that may impact upon health were discussed. Among those public policy decisions are:

- 1) Proposed Elkhorn Lake Project decisions on the various project alternatives based upon the health impacts of these policy decisions outlined in the Elkhorn Dam Study by Nesbitt Engineering
- 2) Examine additional project elements that improve upon community access to opportunities, activities, education, behaviors and community characteristics that influence public health
- 3) Support and participate in decisions and possible new funding alternatives for expenses incurred by the proposed project elements developed and for application to Abandoned Mine Land pilot projects; Promise Zone funding, USDA Rural Development programs and other possible sources

STAKEHOLDER RECRUITMENT AND ENGAGEMENT ACTIVITIES

While the selected HIA project has the City of Jenkins, Kentucky as its focus, there are other stakeholders that could benefit from an HIA such as this type project. Water intensive businesses may

not have been encouraged due to the limitations of the reservoir to serve local customers, particularly in the dry summer months. The location of the dam above the city may cause some concerned residents about the possibility of dam failure. Key stakeholders include Jenkins residents, Letcher county residents, other Kentucky counties interested in upgrading and improving water quality and the water supply as well as public safety and recreational opportunities.

The HIA Project staff sought ways to involve a variety of community stakeholders, although key stakeholders are Jenkins residents. Our first step after screening was to walk the project site and have discussions with the Mayor and the City Manager. HIA staff envisioned that residents in the area of the dam might be a separate stakeholder group so a survey of area residents asked about location in relation to the dam. The coal town tradition is low rates of participation in community planning by local stakeholder groups. Mine operators and miners have had a tumultuous and violent history of conflict. Recently, this conflict history reversed as the community, miners and mine operators have worked together to save the coal industry. Using community surveys helped us identify residents willing to become involved with the HIA in some fashion.

Focus groups of these local persons shed additional light on the Elkhorn Lake project decision making and priorities. Groups with possibly differential impacts that were targeted for focus groups were: 1) Older adults who are less likely to use park and 2) High school students and teachers of both genders and children likely to use park.

The major newspaper in Letcher County is called the Mountain Eagle (see www.themountaineagle.com). There are no newspapers, radio or television stations in Jenkins. There are several YouTube videos posted by local media production resources. The workgroup also identified organizations and persons who have knowledge, authority and interest of the HIA topic. Organizations that were identified are University of Kentucky faculty, Kentucky Environmental Advocates and Kentucky dam safety operatives and technicians. Steps taken to recruit and engage the community were:

- Identified key stakeholders from the KRADD Board of Directors and staff as well as natural allies such as the University of Kentucky Center for Excellence in Rural Health, Breathitt County Health Planning Council for Children, Health Departments and Juniper Health
- Created a workgroup that served as a committee to provide guidance and advise the Health Impact Project. Maintained regular correspondence with workgroup including face-to-face meetings. Workgroup members were offered the opportunity to review and comment on the scoping document.
- Presentations at the District's Board of Directors' meeting to provide a synopsis of the Health Impact Assessment and to enlist their support and interest.
- Provided training to KRADD board members and health department personnel on health impact assessment.

Elkhorn Lake Improvement Project

- Continued to identify other individuals and agencies with specific interest to the Elkhorn Lake Improvement Project such as staff from: Jenkins water and sewer departments, City of Jenkins, KRADD's Water and Wastewater, Fish and Wildlife, tourism, and parks and recreation.
- Established the HIA project website, (www.elkhornlakeproject.org), Facebook page and email list to provide a forum for discussion and recruitment of interested participants.

STRUCTURE AND ORGANIZATION OF WORKGROUP ADVISORS

The workgroup advisors were members from Jenkins and other health policy leaders from the region. The purpose of the workgroup was to provide feedback and information regarding the Health Impact Assessment. The Project Director, David Mathews, Ph.D., set the agenda and facilitated all workgroup meetings with decision making process occurring through open discussion and utilizing consensus for final decisions. The Project Coordinator, Donna Hardin, obtained meeting locations, provided communication between meetings utilizing email polls and provided materials to the workgroup. Throughout the HIA, Emily Bever and Jimmy Dills provided valuable coaching.

Baseline Demographics, Research Goals, and Health Indicators for Letcher County

JENKINS AND LETCHER COUNTY GEOGRAPHY AND DEMOGRAPHICS: Jenkins, KY sits among steep mountains in the coalfields area where Virginia, which is on Jenkins' southern border, West Virginia and Kentucky converge. Here is some basic information about the area.

Jenkins and Letcher County Kentucky				
Population	Jenkins 2,350	Letcher 23,382	Pop. Change – down 4.6%	Median age 42.0
Income	Median family income: \$37,875		Low-income families: 65%	
Education	75.1% high school graduates		100% rural area	
Poverty	Children in poverty: 44.7%; Children in deep poverty: 29%		Overall county poverty: 39.5%	

From www.census.gov/quickfacts ^(1,3)

HIA GOALS, METHODOLOGY, AND RESEARCH QUESTIONS

This Health Impact Assessment (HIA) focused upon planned improvements to the Elkhorn Lake Park, dam and reservoir in Jenkins, Letcher County Kentucky. The city government rationale for the improvements is to improve drinking water, public safety and recreation.

Drinking water has become a major issue in southeastern Kentucky because historically, many families have not had access to clean drinking water. Well water was often too difficult to obtain by digging in the rocky terrain. Most families got their water from the plentiful streams, creeks or rivers. As mining increased in the region, runoff from the mines, pesticides, fertilizers, animal waste or other upstream pollutants sometimes infiltrated water supplies. The City of Jenkins municipal water supply comes from Elkhorn Lake, which was constructed in 1912. Elkhorn Lake became a city-owned reservoir for the Jenkins water system in 1976 when the property was donated to the city. The Jenkins water plant has a design capacity of a million gallons per day with current demand of 300,000 gallons per day by 874

Elkhorn Lake Improvement Project

customers ^(1.1). The City Engineer's plan is to make repairs to the dam to prevent erosion and further leakage. In addition, it is believed the vegetation in the lake has decreased the surface area by several acres. Decreased surface area means less water, less oxygen in the water and greater concentration of biodegrading materials that could impact water quality.

The Elkhorn Lake Improvement Project (ELIP) includes proposed components such as:

- Geotechnical investigation to ensure the integrity of the bedrock under the dam;
- Grouting of the dam abutments to reduce the leakage;
- Closing one pipe penetrating through the dam, lining the other pipe and placing a valve;
- Rehabilitation of the concrete face as well as the principal spillway system;
- Dredging of the impoundment, which includes removal of water lilies;
- Rehabilitation of the stream above and below the impoundment; and
- Construction of a walking trail and landscaping around the lake to aid in erosion control.

Estimated costs for this project have been examined multiple times through applications for funding from the federal Abandoned Mine Lands grant source by the current and past city administrations. The Elkhorn Lake Improvement Project has a current estimated overall cost of \$2,800,000 ^(1.2).

The HIA analysis strives to identify health-related strategies that improve the project design and help improve water quality, recreational opportunities, reduce environmental hazards and increase community development and overall quality of life in Jenkins. This HIA prototype could also serve as a model for other southeast Kentucky communities. For the purposes of this **Health Impact Assessment**, the major SMART Goals (specific, measurable, attainable, relevant and timely) of the Elkhorn Lake Improvement Project (ELIP) are:

HIA SMART Goal 1: KRADD staff shall inform the ELIP plan and any revisions to each corresponding AML Pilot Project or other grant applications for the next two years with any new information from a broader human health perspective that otherwise might not be included through environmental, engineering or other assessments.

HIA SMART Goal 2: KRADD staff shall provide at least three opportunities for public engagement with, and citizen participation in, the planning process for the ELIP and the development of each AML Pilot Project proposal during 2018-2019.

HIA SMART Goal 3: Using the ELIP as an example, KRADD staff shall assist KRADD members and partners to understand the potential measurable health impacts of some important public policy decisions they make in their roles as governmental and community leaders during 2018-2020.

HIA SMART Goal 4: KRADD staff shall henceforth place into context potential health impacts within longer term community development strategies and opportunities, such as the annually updated community, economic development and housing plans by adding a section with the latest health indicator for each county in the region, noting changes from year to year.

BASELINE HEALTH INDICATORS AND CURRENT HEALTH OUTCOMES STUDIED

Relevant Letcher County Health Disparities Compilation from US News and World Report ^(1.5) , Kentucky Health Indicator Reports ^(1.6) and Community Commons ^(1.7)			
	Health Determinants	U.S. rate	Letcher County
Population Health	Life Expectancy	77.9 years	72.4 years
	Poor or Fair Health	16.1%	23.2 %
	Deaths of Despair	38.5/100k	76.6/100k
	Adults Without Leisure activities	24.3%	32.7%
	Smoking Rate	18.1%	28.4%
	Lung Cancer Mortality	41.3/100k	90.3/100k
	Cancer Mortality	160.9/100k	218.3/100k
	Cardiovascular Mortality	99.6/100k	203.3/100k
	Injury Mortality		92.5/100k
Water and Park Environment	Unsafe Drinking Water	1.1%	13.2%
	Walkable Destination	4.8%	0.0%
Housing	Net Migration	+1.0%	-3.2%
	Flood Zone Housing	3.8%	14.1%
	Substandard Housing		24.6%
Food and Nutrition	Obesity	31.0%	38.4%
	Diabetes	9.3%	15.3%
U.S. News & World Report rankings show how nearly 3,000 U.S. counties and county equivalents perform in 81 metrics across 10 health and health-related categories. The broad framework of categories and subcategories is based on factors key to evaluating community health that were identified by the National Committee on Vital and Health Statistics —a policy advisory board to the head of the U.S. Department of Health and Human Services—as part of its Measurement Framework for Community Health and Well-Being. U.S. News adapted the NCVHS model in consultation with leading population health experts, resulting most notably in the inclusion of an equity category.			

ASSESSMENT METHODOLOGY: Following the Health Impact Assessment generally accepted steps to arrive at recommendations, the HIA Staff developed the following methodology to answer the research questions as best as possible. Based upon the research questions we developed for the Health Impact Assessment, the HIA staff undertook identification of sources of information to answer the research question. In total, we developed information from 14 sources:

Sources of Information for this Assessment	
<i>INTERVIEWS WITH SUBJECT MATTER EXPERTS</i>	<i>SURVEY OF STUDENTS</i>
<i>INTERVIEWS WITH PUBLIC OFFICIALS</i>	<i>SCIENTIFIC JOURNAL ARTICLES</i>
<i>INTERVIEWS COMMUNITY MEMBERS</i>	<i>GOVERNMENT REPORTS</i>
<i>FOCUS GROUP OF STUDENTS & TEACHERS</i>	<i>ENGINEER INTERVIEWS</i>
<i>NEWSPAPER ARTICLES</i>	<i>ENGINEERING REPORTS</i>
<i>TELEVISION VIDEO</i>	<i>SPECIAL INTEREST PUBLICATIONS</i>
<i>SURVEY OF WATER CUSTOMERS</i>	<i>ENVIRONMENT GROUP REPORTS</i>

For the various sources we examined:

- How EVIDENCE (data) were generated or collected;
- How FINDINGS are generated from this evidence;
- So, RECOMMENDATIONS may be derived from these findings

To these ends, the research issues and sub-questions addressed for this assessment are:

1. Research issue studied: Does the structural integrity of the dam impact public safety risks and the perception thereof?
 - a) How does public confidence in dam safety, structure and function change?
 - b) Does the public perceive the threat of dam collapse?
 - c) What are the injury risks associated with dam collapse?
 - d) Does any dam-induced stress relate to overall mental health and stability in the community?
2. Research issue studied: What are the differential impacts on water quality in Elkhorn Lake based on decision alternatives?
 - a) Does the water quality of the city of Jenkins water supply improve as a result of removing vegetation and dredging biohazard sediments from Elkhorn Lake (as measured by weekly and monthly samples collected by Jenkins water department personnel and analyzed as required by Kentucky water quality monitoring using an approved laboratory)?
 - b) Does consumption of the water supply increase in terms of gallons used and number of customers as reported by the Jenkins Water Department?
 - c) What contaminants currently exist in Elkhorn Lake and what are the associated risks to human health?
 - d) How does water quality influence use of the lake for recreation?
3. Research issue studied: How are potential changes to park amenities around Elkhorn Lake likely to influence people’s behavior in terms of physical activity and/or social interactions, compared to current activity levels?

- a) Do picnic and fishing areas, walking and biking trails and lake access for non-motorized boats change the level of physical activities?
 - b) Does the community recreational use of the Elkhorn Lake Park increase from current levels (as measured by the direct observation of the number of persons accessing the lake for water sports such as kayaking and fishing)?
4. Research issue studied: How will proposed improvements to the dam, lake and/or surrounding park space influence broader determinants of health through promoting community development?
- a) How do changes to the structural integrity of the dam influence development potential for Jenkins?
 - b) How has water quality limited economic development potential in the past and how might that change with lake improvements?
 - c) How much do park improvements contribute to the area's attractiveness for local or outside investment in the housing stock and/or business?

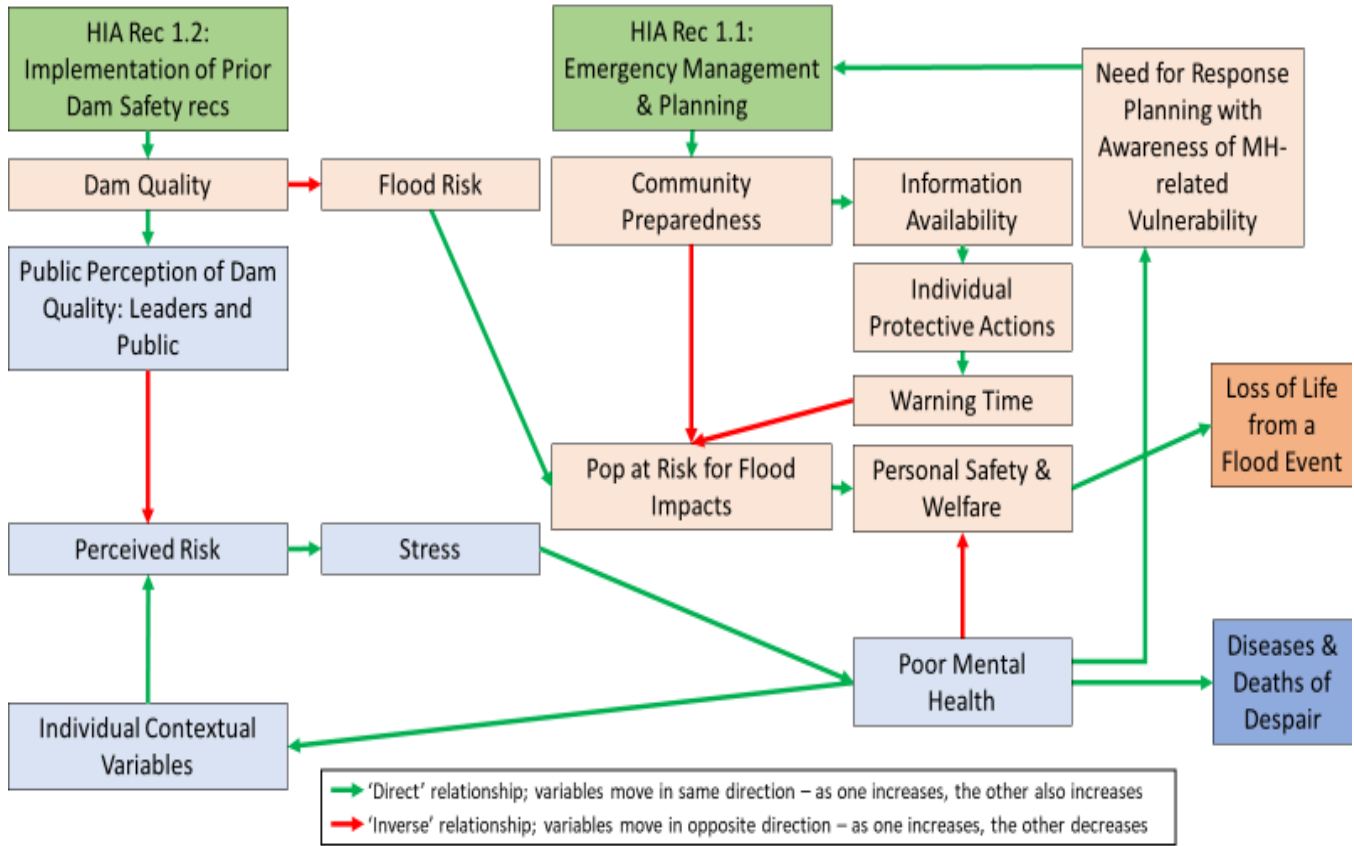
The following four assessment report sections strive to answer each of these research questions in turn. Preceding each research question section is a pathway diagram showing how the research question is related to the associated policy decisions and ultimately the community health outcomes. The sub-questions correspond to the immediate impacts in the pathway diagram.

Assessment and Recommendation for the Elkhorn Lake Improvement Project

Fortunately, a wealth of information exists on dams in the United States, water quality, community parks and health and community development. In fact, multiple sources of information exist about the history of Letcher County Kentucky and Jenkins, as well as reports and articles in print. The HIA Staff accumulated the information available including documents from the Jenkins city officials, reports from the city engineer, both recent and historical photographs and research reports from the scientific literature that are available online using the library systems. Elkhorn Lake has served Jenkins as the drinking water source and water source for mining operations for over 106 years. But over the past several decades, there has been increased concern about the dam safety, the water quality in Elkhorn Lake, the amenities in the park that surrounds the lake and how the lake (which is centered in the middle of town) could be used to attract more residents for recreation and businesses for economic development. The problems related to dam safety are not unique to Elkhorn Lake and Jenkins.

Research Issue 1 - Elkhorn Lake Dam Safety and Public Health

Conceptual Pathway for Research Issue 1: Elkhorn Lake Dam Safety and Public Health



Kentucky has 963 dams ranging in use from major flood control, water supply or recreational dams to coal waste impoundments according to James Bruggers in the Louisville Courier Journal^(1.8). Kentucky's most recent major dam emergency occurred in 2007, when the Army Corps of Engineers began lowering the water level in Lake Cumberland because of fears of dam failure, flooding and possible loss of life as far away as Nashville, 100 miles away. Most of the state's dams were built between 1950 and 1980, with some much older such as the Elkhorn Lake Dam, which was built in 1912. Until there is an emergency, like the recent one in California at the Oroville Dam, the public does not know of the risks. A Department of Water^(1.9) report submitted in 2017 as part of a National Dam Inventory listed 79 high hazard Kentucky dams in poor condition including Elkhorn Lake Dam.



Elkhorn Dam Spillway

Elkhorn Lake Improvement Project

The Elkhorn Lake Dam is situated on Elkhorn Creek above the downtown area of Jenkins, Kentucky. Engineering reports show approximately 30% of the town's population lies below the 40-foot tall and 225-foot wide dam. The spillway shown here is on the north face in an overflow area and flood zone along with the downtown business district. There is a medical facility, an elementary school and over 136 residences and other buildings in the same area below the dam. ^(1.10)

The Elkhorn Lake Dam is constructed of concrete reinforced with steel rebar. The Consolidation Coal Company built Elkhorn Lake Dam to the construction standards of the era, which permitted dams with a high spillway that caused flood waters to overtop the entire dam after heavy rains when the lake was full. As far back as 1976, the National Dam Safety program of the U.S. Army Corps of Engineers expressed concern with the dam safety. Their report stated that the dam appeared to be structurally sound but required a Phase II investigation to determine the stability of the structure with an intermediate priority. The Kentucky Dam Safety (KDS) criteria rank each dam as one of four ratings: Good, Fair, Poor or Unsatisfactory. They describe the two lowest ratings as: Unsatisfactory (Dam is unsafe), and Poor, as KDS rated Elkhorn Dam, which has multiple maintenance deficiencies that can affect the operation of the dam, some of which may be structural or need further evaluation by a qualified engineer. The Elkhorn Lake Dam report rated the dam condition as Poor because:

- 1) Dam may have structural issues.
- 2) Dam may have significant seepage/leakage issues that need to be address (shown above).
- 3) Conditions are **not** bad enough to warrant a lowering of the reservoir.

Ongoing seepage from Elkhorn Dam



On October 12, 1983 and subsequent to the 1976 dam safety report, Burge, Wagonner, Summer, and Carroll, Inc. of Knoxville, TN, completed emergency repairs. They began a long-range water system improvement program for the City of Jenkins. Their 1983 report made the following recommendations pertaining to the dam:

- Reservoir storage capacity has been greatly reduced by siltation and needs to be dredged to increase the storage capacity.
- The concrete face of the dam and wings has sloughed off and need to be repaired.
- There are several minor leaks in the dam that need to be repaired.
- The gates to allow the reservoir to be drained to bypass flow in high water conditions are totally inoperable and need to be replaced.
- Methods need to be devised to help control the silt and sand that are carried into the reservoir by runoff from the drainage basin.

Nesbitt Engineers of Lexington, KY undertook an extensive study of the Dam safety in 2010 at the request of the City of Jenkins. The Nesbitt engineering report examined stability and safety of the dam; catastrophic failure and flooding; water lily issue and dredging; alternate drinking water sources; soil samples from shallow bore holes; and the nearby underground mine reservoir. The water and soil testing included examining samples for banned chemicals such as heavy metals. Nesbitt Engineers contracted with another firm, which concluded the dam does have adequate factors of safety against sliding and overturning. The water seeps in the dam in 2010 did **not** present a safety issue but should be monitored on a monthly basis for drastic increases in flow. The engineers recommended maintenance on the downstream face of the dam and plugging of an old 42-inch pipe penetrating through the structure.

The Nesbitt Engineers reported that a catastrophic failure would cause significant structural damage and probable loss of life. There are approximately 136 residences, public buildings and one school impacted as well as roads bridges and other structures. In January 2016, the dam was again inspected by engineers from KDS, Division of Water of the Department of Environmental Protection ^(1.11). The Division of Water inspects all Kentucky dams frequently, depending on the rated condition of the dam. The 2016 inspection report again

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Recent community surveys with water customers and student groups revealed an age difference in the public confidence in the dam safety.

The water customers ranked the removal of the water lilies as top priority at 85% and repairing the Elkhorn Lake Dam leakage second at 74%.

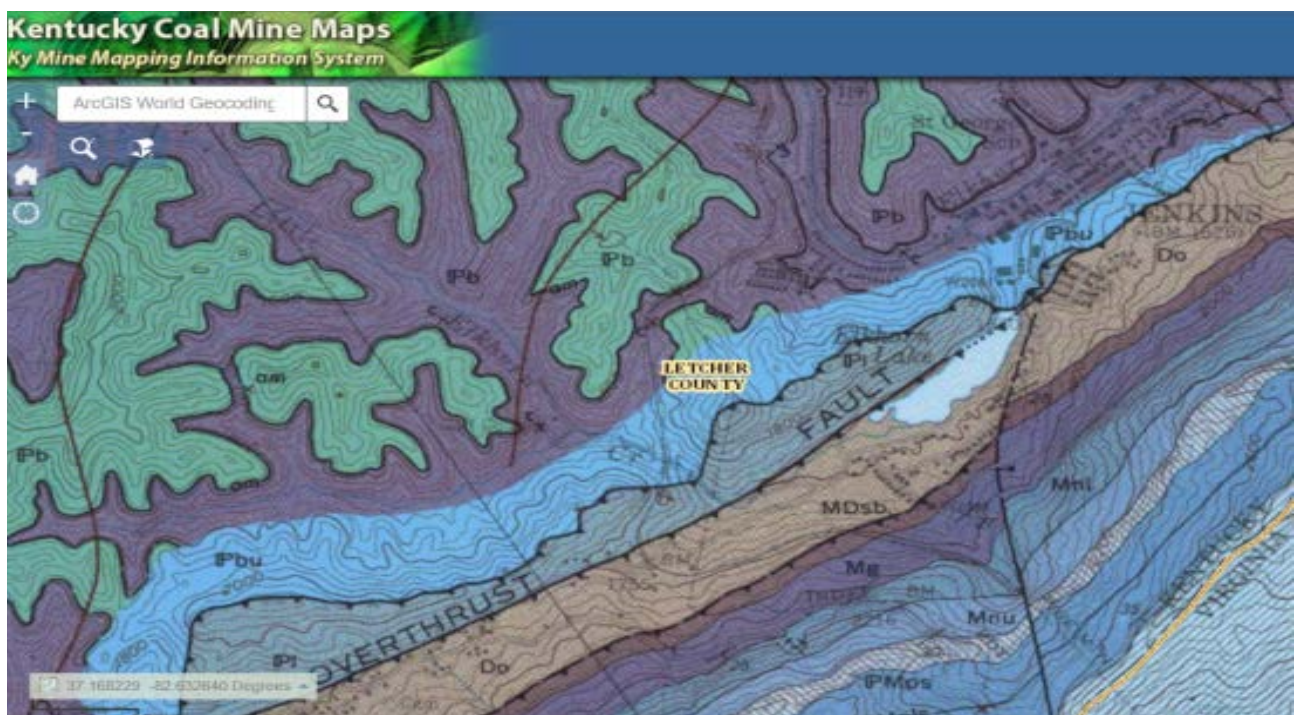
The Student Survey ranked fixing dam leakage and safety at number 1 with 72% agreement and water lily removal far down the list at 36%.

rated the dam condition as Poor and the situation as Hazardous. The Hazardous rating was because of the numerous buildings and the population immediately below the dam. The Dam Inspectors recommended the following:

1. Repair the surface of the downstream slope.
2. Repair all cracks on the structure and monitor them for changes.
3. Monitor the seepage flow at the toe of the structure for any changes and/or flow. A weir must be installed to monitor flow volume.
4. Prepare an Emergency Action Plan to supplement the Breach Analysis of the City of Jenkins.
5. Monitor all leaks in the dam for changes in color and/or flow.

RESEARCH QUESTION 1.A) PUBLIC CONFIDENCE IN THE DAM:

Newspaper articles from the Letcher County newspaper, *The Mountain Eagle*, reveal discussions by Jenkins officials at city council meetings concerning the dam safety dating back to the 2010 Engineering study. An article from November 22, 2012 stated that state and local officials are conducting tests on the dam at Elkhorn Lake to determine if a recent 4.3 magnitude earthquake centered in nearby Blackey has enlarged the flow of a small stream at the bottom of the dam. The Associated Press said the earthquake is the fourth largest in Kentucky history. Inspectors from the Kentucky Division of Environmental Protection joined Jenkins city officials and engineer Paul Nesbitt for an inspection on November 16, 2012 after Nesbitt found that the small stream running below the dam had grown to be 10 times larger than it was five years ago. Nesbitt said the situation is not a cause for panic. "All dams leak," said Nesbitt. "But this is not a slight change. It's 10 times the flow. I'm not saying to evacuate, but it's a concern (1.13)". The U.S. Geological map, shown above, reveals the Pine Mountain Overthrust Fault passes through the dam and lake. Three recent earthquakes felt by residents were in the range of 3.0 to 5.2. Earthquakes in the area have occurred as recently as July 17, 2019.



Other *Mountain Eagle* articles show a lack of confidence in the dam expressed by the former Jenkins Mayor Charles Dixon. He wrote 50 letters to the Governor and other public officials asking for help. He wrote a letter to the editor for publication in the *Mountain Eagle* in September 2010 where he stated, “I cannot think of a project that is needed more than the lake and dam project at Jenkins. I have written, called, e-mailed, and begged for help to anyone who will listen. My term is up in three months, but I live here and care for those people who could lose their lives if the dam was to break.”

Mayor Dixon gave the history of the dam, which he describes going back to the construction in 1912. If legal action were ever contemplated this long-term chain of events may complicate that alternative. ^(1.14) “In 1946 Consolidation sold the dam to the Kentucky Water Company. Following this change of ownership, Elkhorn Lake began serving the community as a water supply source. The dam and lake were later sold to the City in 1986, which still owns this facility today. The only known modification to the dam was performed around 1963 by the Mattingly Bridge Company from Louisville, Ky. A concrete cap was added to prevent the concrete from weathering on the original surface, and to provide an additional one foot of reservoir tonnage capacity. The overflow spillway in the center of the dam was also lined with a new layer of concrete.”

RESEARCH QUESTION 1.B) PERCEPTION OF THREAT

The current Jenkins Mayor Todd DePriest has expressed concerns about the community perception of the possibility of a dam breach. He stated that the community has lived with the threat of the dam for so long that most people do not lose sleep over it, except when there are heavy rains and the lake overtops the dam or when there is an earthquake. He described one overtopping event when he considered ordering an evacuation procedure for the nearby residents.

A focus group of students and teachers at Jenkins High School discussed the perception of threat posed by the Elkhorn Dam. One student commented on the chunks of concrete falling out of the dam exposing the rebar underneath. Another expressed concern about the earthquake threat since the dam is on an earthquake fault. Another student said that local folks try not to think about the dam threat because it could “wash out the whole town.” Still another student said “thinking about it too much might cause it to happen.”

Paul Nesbitt, the City Engineer, has stated that the dam overtopping, which could weaken the dam, represents the greatest threat to the community. After a recent earthquake, he rushed to Jenkins to examine the dam for any cracks or new damage.

In the book *Dam Failure Mechanisms and Risk Assessment*^(1.15), Zhang et al. described what can be done to control risk. They reported that floods due to dam/levee breaks usually have long lead time (hours to days), which provides an opportunity for implementing pre-disaster emergency management to save human life and property. The process of pre-disaster emergency management can be divided into seven phases: 1) observation, 2) risk assessment, 3) decision-making; 4) warning; 5) response; 6) evacuation and 7) sheltering. Making technical decisions under uncertainties is a necessary part or even the major part of the work of a dam safety engineer. Dynamic decision-making under emergency conditions is aimed at minimizing the possible dam-break consequences using primarily non-structure measures, such as warning, sheltering and evacuation by taking advantage of enough time effect. Warning time and a plan for evacuation become paramount in this scenario.

Jennifer Wilson^(1.16) wrote that disaster management involves preparing, supporting and rebuilding society when natural or man-made disasters occur. Emergency management depends highly upon the local economic and social conditions within the disaster region and involves four phases: mitigation, preparedness, response and recovery. The citizens and the community have responsibilities throughout each phase. The general public as well as local, state and federal governments have responsibilities before, during and after a disaster. Some citizens and/or communities are ill-prepared and rely upon government assistance to protect them from disasters. The net result is that personal safety and welfare are entrusted to external large agencies, unable or unlikely to serve in the community's best interests. In the case of Jenkins, entrusting large external agencies to ensure disaster protection has not paid off for them, as former Mayor Dixon could attest.

RESEARCH QUESTION 1.C) INJURY RISKS ASSOCIATED WITH DAM COLLAPSE

DeKay and McClelland^(1.17) wrote for *Risk Analysis* about a method for calculating loss of life (LOL) in cases of dam failure and flash floods. The approach was empirical rather than theoretical because they used actual LOL data from 29 dam failures from around the world coupled with logistical regression statistical methods to identify the salient factors contributing to LOL. Their research revealed the significant factors to be Population at Risk (PAR), Hours of Warning (WT) and Flooding Forcefulness (DV). They concluded that Warning Time was the more significant factor, more than DV, in predicting LOL, particularly when evacuation procedures were swift and well developed.

Mileti^(1.18) et al. wrote that there are a large range of natural and manmade hazards that cause loss of life and destruction of property. Earthquakes may be more difficult to prepare for than other disaster events, but there have been successful disaster preparedness activities for earthquakes. Mileti contended that using something as simple as a brochure can help residents in an earthquake-prone area

decide for themselves the preparedness activities and whether to purchase earthquake insurance and take other steps to protect themselves and their families. The U.S. Geological Survey map of seismic activity in Kentucky and nearby states shows a recorded 892 seismic events above 2.0 since 1900, or another way to look at it is a seismic event above 2.0 every 50 days in the region.



USGS Map of Seismic Activity since 1900 Richter Scale size corresponds with circle diameter

In *10 Tips for Investigating Dam Safety*, Haurwitz ^(1.20) suggested that knowing the city's disaster preparedness plan for a dam breach is essential. He also suggested interviewing those in harm's way to ascertain if the disaster plan has been communicated to those in the Population at Risk (PAR) near the dam. He stressed that Warning Time, even if just 15 minutes, saves lives of those in the PAR.

The U.S. Department of the Interior published a **Dam Failure and Flood Event Case History Compilation** of 70 notable U.S. and other countries' dam collapses between 1928 and 2014 ^(1.19). The Compilation was constructed to show the features of various dam failure scenarios to construct a model of actions that would predict and avoid loss of life (LOL). As a comparison, a dam failure in West Virginia, known as the Buffalo Creek disaster, was selected as an example for a possible future scenario to predict the extent of a disaster at Elkhorn Lake.

In 1972, a coal mine earthen dam collapsed in Buffalo Creek, West Virginia, sending a tidal wave of water, washing out bridges, roads and homes in nightmarish scant minutes. Mannix Porterfield reported in the Register-Herald Reporter ^(1.21) that by the time the flood waters receded, there were a known 125 people dead in the grimy aftermath up and down Buffalo Creek Hollow. Another 1,100 suffered non-fatal injuries, and 4,000 residents were left homeless since it wiped out 502 permanent homes and 44 mobile homes, while 943 other homes were damaged heavily, and 1,000 vehicles were destroyed. The property damage total was approximately \$50 million. The table below of Buffalo Creek dam is shown because of similarity to Elkhorn Lake Dam. A notable difference is that Buffalo Creek Dam was an earthen dam construction for the purpose of coal mine waste containment whereas Elkhorn Lake is a water reservoir with a stronger concrete construction. The overtopping of the Buffalo Creek Dam is described as "*hydrologic induced slumping of dam crest.*"

Following is a summary of the Buffalo Creek Dam Failure. Summary Table Buffalo Creek Coal Waste Dam Failure February 22, 1972	
Flood Severity Rating	Medium
Warning Time (WT)	None to some
Time of Day	Morning 8:00 AM
Failure Scenario	Hydrologic induced slumping of dam crest
Loss of Life (LOL)	125
Fatality Rate	0.031
Dam Height	45 feet
Reservoir Storage	404-acre feet
Breach Formation Time	Rapid
Total Population at Risk (PAR)	5000
Downstream Distance to PAR	Less than 1 mile to 15 miles
Maximum Flood Depth and Velocity (DV)	At Saunders/Lorado, 300 to 400 ft ² /s with high rate of rise at Saunders, but not at Lorado
Flood Severity Prior Understanding	Vague
Confidence in Data	Good, the case has been extensively studied, and the events seem to have been reported consistently between sources.
From the U.S. Department of Interior Case History of Major Dam Failures ^(1.19)	

For context, an article by Kim Ward published in the Charleston Gazette ^(1.22) reported that in 2000, there were forty-five (45) coal mine dams in the Appalachian coalfields of West Virginia, Virginia and Eastern Kentucky in high risk of collapse. Ward stated that *“In a review by the U.S. Mine Safety and Health Administration (MHSa), at least 17 of the “high” potential dams studied were rated as top priorities for follow-up inspection and additional safety precautions. Those dams posed risks to the safety of miners, the public and the environment, according to the MSHA review. But only half of those dams have follow-up plans to address these risks, according to a computer database made public by MSHA.”*

In a study by Nesbitt Engineering ^(1.23) in 2009, there were a total of 136 affected structures associated with a possible Elkhorn Dam breach area. The affected structure breakdown included:

- 57 residences (houses or trailers),
- 33 other structures (sheds or large detached structures),
- 45 public buildings (businesses, churches, or other public buildings and one elementary school). Burdine Elementary has 238 students enrolled.
- A total possible LOL count for these structures is approximately 257 to 558 lives lost in the Population at Risk (PAR) in the downstream hazard area if a no warning dam breach occurred
- Using an estimate of one to three persons per residence impacted, we can calculate 108 could lose their life in these residences. Another 0-33 other persons could lose their lives in the

detached sheds or other structures, and in the public buildings with an estimated occupancy of 5 to 10 persons per building another 45 depending on the day of the week and time of day.

The Nesbitt Engineering Inc. study model estimates that a failure of the dam would release 32,400 cubic feet per second (CFS) of water directly into the City of Jenkins. The surface area of the lake is 15.1 acres. Based upon engineering and dam inspection reports, among the causes of dam failure possible for Elkhorn Lake are breach due to larger than normal earthquake, overtopping, toe erosion and gullying.

Causes of Dam Failure*				
Form	Characteristics	Causes	Elkhorn Lake Dam Issue***	Preventive or Corrective Measures
Over topping	Flow over embankment washing out dam	Inadequate spillway capacity	Yes, definitely	Spillway not designed for maximum flood
		Debris clogging of spillways with	Yes, definitely	Maintenance; trash booms; clean design
		Insufficient freeboard** due to settlement	Yes, definitely	Allowance for freeboard and settlement in design; increase crest height or add parapet
Wave Erosion	Notching of upstream Face by waves, currents	Lack of riprap, too small riprap	Yes, possibly	Properly designed riprap**
Toe Erosion	Erosion of toe by outlet discharge	Spillway too close to dam	Yes, possibly	Training walls
		Inadequate riprap	Yes, possibly	Properly designed riprap**
Gullying	Rainfall erosion of dam face	No sod or poor drainage	Yes, possibly	Sod; fine riprap surface drains
*Hydraulic failures are 30 percent of all failures				
**Riprap is rock used to armor shorelines , streambeds and other shoreline structures against scour and water or ice erosion. Freeboard is the height above the recorded high-water mark of a structure (such as a dam) associated with the water				
*** Possible issues for Elkhorn Lake Dam compiled from various reports				
Kentucky Guidelines for Maintenance and Inspection of Dams Source: George F. Sowers of the Law Engineering Testing Company ^(1.24)				

RESEARCH QUESTION 1.D) OVERALL MENTAL HEALTH AND STABILITY IN THE COMMUNITY

“It is universally accepted that optimum levels of stress can act as a creative, motivational force that can drive people to achieve incredible feats (eustress). Chronic or traumatic stress (distress) on the other hand, is potentially very destructive and can deprive people of physical and mental health, and at times even of life itself.” C. P. Bryce in Stress Management in Disasters ^(1.25)

Baldwin and Ranstone ^(1.29) wrote in 2018 about the need for Health Impact Assessments to include community mental health. Development projects inevitably pose risks to the health of humans and the planet. They discussed the scientific literature on “public perceived risk” and described instruments that have been developed to measure mental wellness impact assessment (MWIA). They stated that *“Health impact assessment (HIA) practitioners increasingly evaluate the mental health effects of development but have rarely considered those caused by public understanding of risk (‘risk perception’) itself a determinant of*

health.” They concentrated on anxiety disorders mitigation by the individual as the risk and protective factors available to the individual. They proposed a new psychosocial model of public understanding of risk in response to the literature on perceived high-risk developments. This conceptual model presents a much more complicated view of the health pathways than normally associated with HIA’s.



One thing I like about the Elkhorn Lake is the fact that it's very family friendly. It has a playground, bicycle rack, shelter, and picnic table - all of which are in very close proximity to one another. This allows families to spend time together without leaving their home community.

Photo by Shaun Michael Collier Jenkins Middle School 6th grade

Renn ^(1.26) discussed how mental health, stress and risk perception interact. Risk perceptions are only slightly correlated with the probability distribution for negative health impacts. Context variables such as dread and personal control are important predictors for the perceived seriousness of risk. Renn suggested that cultural patterns of risk perceptions emphasize different response sets to risk information, depending on cultural priorities such as social justice versus personal freedom.

In discussing disaster preparedness to reduce anxiety and post-disaster stress, Catherine Grant, at the Institute of Development Studies ^(1.27) wrote that “more effort is required that addresses the effectiveness of mental health interventions to reduce the impact of disasters.” She suggested that an advance study is necessary on the topic of mental health preparedness for disasters. She also noted that the experience of dealing with the 2004 Indian Ocean tsunami emphasized the fact that disaster preparedness strategies must meet the mental health and psychosocial needs of the community.

Over the past several years, research conducted by health economists Anne Case and Angus Deaton ^(1.30) has focused on the increasing morbidity and mortality from three main causes—alcohol, prescription drug and illegal drug overdose; suicide; and alcoholic liver disease/cirrhosis of the liver, which have been referred to as “deaths of despair” or “diseases of despair.” The Appalachian Regional Commission commissioned a study to look at diseases of despair in Appalachian region. These analyses include the ICD-10 codes referenced by Case and Deaton, reflecting underlying cause of death from each of the three

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diseases of despair—alcohol, prescription drug and illegal drug overdose; suicide; and alcoholic liver disease/cirrhosis of the liver. The combination of the death rates for the three diseases of despair is combined to give an index of despair for a county. Letcher County’s rate of despair is among the highest nationally, although not as high as nearby counties with higher drug overdose rates. It should also be mentioned that suicide is not an illness like alcoholism or drug addiction but is used here to reflect the level of depression that is a widespread illness in Letcher County. These deaths of despair could be taken as an indicator of community health and stress. The added stress of living in a community where a dam failure could occur without warning could be linked to the drug use, alcohol use and depression.

For Letcher County, sources of information on community mental health are available from the County Health Rankings website. While the County Health Rankings use dozens of variables associated with health for overall community and county rankings of health, there are just a few associated with mental health. These include poor mental health days, drug overdose, deaths, and mental health providers ratio to population. Additionally, there are alcohol impaired driving deaths and several social and economic factors such as children in poverty, violent crime disconnected youth, residential segregation, homicides, firearm deaths, household income and injury deaths. In communities such as Jenkins where there are already high levels of deaths of despair, unhappiness and poor mental health days, planning for disasters that recognize mental health vulnerability is important.

Mental Health Related Indicators for Letcher County			
Baseline Data from County Health Rankings ^(1.32)			
	Letcher County	United States top performers	Kentucky
Poor Mental Health Days	4.8	3.1	4.8
Drug Overdose Deaths	23	10	28
Mental Health Providers	1520:1	330:1	520:1
Alcohol Impaired Driving Deaths	24%	13%	16%
Children in Poverty	45%	12%	24%
Children in Single Parent Households	43%	20%	35%
Social Associations	8.2	22.1	10.7
Household Income	29,300	65,100	46,600
Disconnected Youth	26%	10%	16%
Firearms Deaths	20	7	15
Violent Crimes	34	62	215
Residential Segregation	25	14	51
Diseases of Despair ARC report ^(1.31)	76.6	38.5	91.1
<p>Bold statistics indicate exceeding state and/or national data. Jenkins, as the most populous city in Letcher County, is likely similar statistics.</p>			

Letcher County has significant mental health and stability issues based upon available data from a variety of health ranking sources. Poor mental health days, lack of mental health providers, alcohol driving deaths and deaths of despair as a cause of death are above the state and national figures. The table above shows baseline mental health indicators for Letcher County compared to the state and nation.

The Letcher County mental health and community stability data indicates a high level of stress in the entire county, which suggests a need to reduce community stress in Jenkins. The international reports of multiple dam failure as a threat to life, the aging and declining status of the dam, overtopping of the dam after heavy rains, earthquakes in Letcher County, the dam sitting on Pine Mountain Overthrust Fault and current dam seepage increasing tenfold after a 4.6 Richter scale earthquake leads us to make the following recommendations.

HIA RESEARCH ISSUE 1 – DAM SAFETY AND HEALTH

Since 1912, the dam has deteriorated with seepage from the dam face constant and increasing. At the time the dam was constructed, the coal company likely did not know that the dam was in an earthquake zone with an earthquake fault running directly through the dam. Since the Elkhorn Lake Dam's construction, there have been hundreds of small quakes in the area, which have increased the dam seepage but have not caused a breach. The Kentucky Division of Dam Safety has rated Elkhorn Lake as a High Hazard dam with its condition rated as Poor. When constructed, the dam's design called for pipes to penetrate the base of the dam to supply water to a hydroelectric plant, and spillway at the top of the dam to release pressure on the dam during flood conditions. Over time, these efforts to control hydrologic pressure on the dam have become ineffective. Any heavy rainstorm causes the lake waters to overtop the dam. Overtopping is a condition attributable to a large share of dam failures worldwide. If there were a dam failure, several hundred lives could be lost if there were no warning and evacuation.

FINDINGS – Because of the possible structural deficiency; the presence of the frequent low-level earthquakes in the area and the increased geologic instability, Emergency Action Plans need to be devised to prevent potentially catastrophic consequences for which the community is not currently fully prepared.

The KRADD HIA team along with the assistance of the Jenkins Mayor and residents developed these recommendations in response to the finding from the assessment. Because the water is a valuable community resource to preserve and protect health, these recommendations are made:

RECOMMENDATION 1.1 - Community organizations such as volunteers, fire, police and emergency management play a role in preventing disasters. The ability of some communities to prevent disasters and mitigate the impact of disasters has declined, as traditional communities have decreased, and younger people have left the area seeking employment. Older adults and persons with physical and mental disability have increased. To prevent loss of life due to a dam breach disaster, it is necessary to

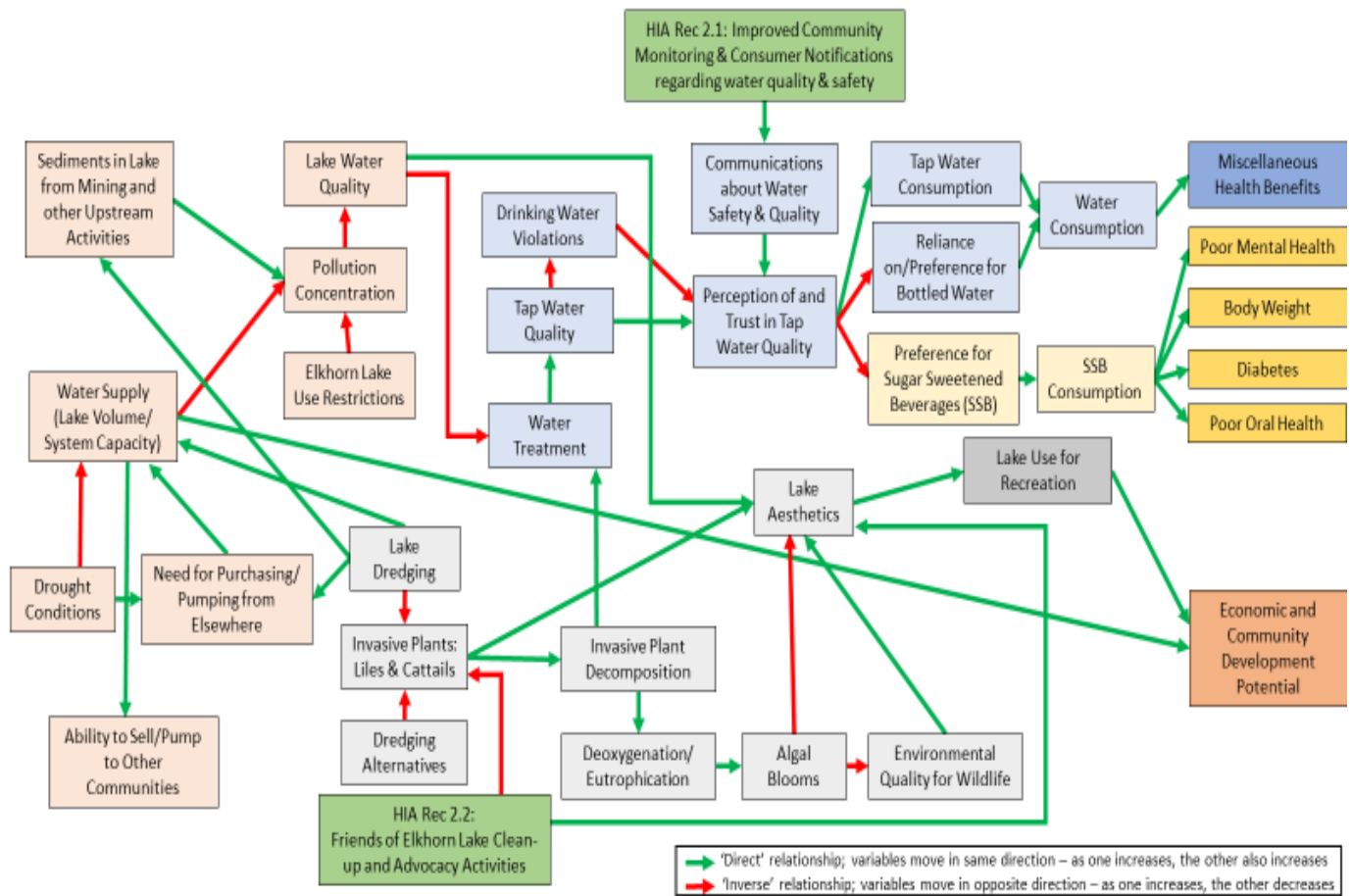
make local disaster prevention efforts a priority and an ongoing occurrence. The public as well as the governmental authorities need to participate and cooperate to protect their communities. Their efforts should be reflected in city administrative planning. In order to find ways to involve local residents in disaster prevention, there is a need for the city officials, fire department and police to develop an alert mechanism, conduct drills with evacuation exercises, ongoing prevention education activities and provisions for the transportation of local residents to safety as required components of disaster preparedness activities.

FINDINGS - Some of the recommendations of the dam inspectors have been repeated from report to report. Close compliance with the inspector's recommendations could improve structural integrity of the dam, help reduce community stress and increase public confidence in the city's preparedness.

RECOMMENDATION 1.2 - The City of Jenkins is encouraged to follow the recommendation of prior dam inspectors and engineers: to routinely manage and maintain the dam face, and as soon as possible, rehabilitate the discharge pipes to relieve pressure on the dam at times of flooding. Improving the maintenance, brush control and debris located in the public works area below the dam could decrease erosion and increase public perception of the city's attitude toward safety and prevention. In addition, closely monitoring the dam for overtopping, cracks or increased seepage by at least two persons every day as recommended by dam inspectors ^(1.33). These steps could help reduce community stress and increase preparedness. In other words, prepare for the worst and hope for the best, until resources become available to perform the major safety improvements.

Research Issue 2 - Water Quality Impact on Health

Conceptual Pathway for Research Issue 2: Water Quality Impact on Health



Throughout the 106-year history of Elkhorn Lake water has flowed into it naturally from Elkhorn Creek and the surrounding hills. These flowing waters have brought with them sediments from mining, erosion from agriculture and highway construction. The major highway construction project above Jenkins produced a cut in the Pine Mountain, which is considered a geological marvel (2.31). The Route 119 highway construction in the 1990s revealed the Pine Mountain Fault and many layers of rock. Although the Pine Mountain Fault was already known as a classic example for studying fold and thrust belts, excavation at Pound Gap uncovered a nearly complete sequence of Late Devonian, Mississippian and Early Pennsylvanian



strata on the Kentucky side of Pine Mountain according to Kentucky geologist Donald Chestnut. The massive construction project took years and produced sediments above Elkhorn Creek. Nearby surface mining required mountain top removal, which also produced sediments that likely flowed into Elkhorn Creek.

Visitors to Elkhorn Lake in spring and summer are quick to notice the blooming water lilies that cover most of the lake. The fragrant white-water lily (*Nymphaea odorata*) is a hardy plant with a huge native range and beautiful flowers that grows in shallow, slow moving water and can take over the surface of a lake. Although lovely and romantic, water lilies are a non-native invasive species to the area. Each year, the water lilies die and decompose, causing water deoxygenation. The reduction of oxygen in the lake causes algae blooms to increase and reduces the environmental quality for wildlife (Breen, Curtis and Hynes).^(2.1)

RESEARCH QUESTION 2.A) DO WATER QUALITY IMPROVEMENTS IMPACT HEALTH

Does improving water quality in a lake, stream, river or pond increase its consumption as drinking water? The Centers for Disease Control and Prevention connects water quality to many aspects of life and health.^(2.29, 2.30) Not only is it necessary to sustain life, clean water helps 1) keep your temperature normal; 2) lubricate and cushion joints; 3) protect your spinal cord and other sensitive tissues; and 4) get rid of wastes through urination, perspiration and bowel movements. Many researchers have reported relationships between perceived quality, and risk in drinking tap water consumption and amount consumed^(2.24, 2.23, 2.26, and 2.28). Meanwhile as the quality of water declines worldwide, some researchers report declining rates of trust in tap water, increasing reliance on bottled water, with even higher preference rates for other beverages such as sugar-sweetened beverages (SSB)^(2.29, 2.28, 2.24). U.S. consumers are more likely to report bottled water as their primary source of drinking water when they perceive local drinking water is not safe.^(2.24) While the amount of bottled water consumed is increasing,^(2.24) researchers have reported differences in the amount of tap water or plain water consumed varies by gender (women drink more bottled water), age (older adults drink less water), socioeconomic class (lower classes rely more SSB) and ethnicity (Latinos prefer bottled water or SSB). There is greater distrust of the local tap water quality among minorities.^(2.21, 2.23, 2.25 and 2.26) Even though the local tap water may meet or exceed water quality standards, many Americans do not perceive the water as safe^(2.27). Less water may get consumed than is desirable according to the CDC^(2.30), or other beverages get consumed that cause health problems. Soft drink consumption or SSB has been linked to mental health problems^(2.20), increasing body weight in adolescents^(2.21). Type 2 diabetes and poor oral health.^(2.28, 2.22)

Apparently more important than tap water quality is the potential user's perception of the water safety and purity. Public health efforts to promote healthy beverages should recognize the potential impact of tap water perceptions on water and SSB intake among youth and minority populations. The implications of these results suggest that water authorities and public health officials need ongoing communications about the safety and quality of the water systems. Using social marketing strategies to

promote tap water is one way of reaching a wider audience ^(2.24, 2.25). The widely held belief of participants in the Student and Teacher focus group held at the Jenkins School was that the water was not safe. The Jenkins Mayor ^(2.9) reported that the city has restrictions on the use of Elkhorn Lake to safeguard the water. No gasoline boat motors are permitted to use the lake. The city has an ordinance against feeding the migrating ducks and geese to reduce pollution. The city officials have long held the belief that adding to the lake capacity would help dilute pollutants and prevent water shortages in times of drought. Making the water supply more plentiful increases the potential for economic and housing development. Mayor Jenkins asserted that the water quality is good despite the threats posed to water quality.

While Elkhorn Lake is on a smaller scale lake to Australia's Lake Hume, it may be more susceptible to algal blooms. For comparison purposes, Crase and Gillespie ^(2.5) in 2012 reported about Lake Hume as a significant water reservoir located at the headwaters of the Murray River. Water quality in Lake Hume had recently been investigated because of evidence of eutrophication in the form of blue-green algal blooms. In this case, there is excessive richness of nutrients in the lake due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen. Crase and Gillespie were concerned with how eutrophication affected the local economy. Their study found recreational values of about \$3 million per annum when the lake was near capacity, and the threat of algae contamination was low, but when algae increased, the lake use and economic value to the community decreased sharply. Dodd et al. ^(2.2) report fishing and boating activities are physically impeded by the eutrophication-driven algal blooms and water users are less likely to swim, boat and fish during algal blooms due to health risks, unfavorable appearance and unpleasant odors. Calderon ^(2.6) et al. extended the economics literature on the relationship between water quality and residential property pricing by separately testing the relationships between both water clarity and quality, and the price of lakeshore residential properties. Their results indicate that as water quality and clarity improve, prices for lakeshore properties increase. Jenkins interest in community development is connected to Elkhorn Lake water quality and clarity here.

Jenkins Water Treatment Plant looking north from Elkhorn Dam



Former Jenkins Mayor Dixon ^(2.4) wrote a letter to the editor of the *Mountain Eagle* in 2010 saying: “The water lilies are a non-native invasive freshwater plant. The water lilies have taken over almost three fourths of the lake. They grow to a depth of ten (10) feet. The dead and decomposing plants enter the flow for the water treatment plant and create water treatment issues. The surest way to deal with this issue is to dredge the shallow areas of the lake. This will also increase the water storage area of the lake by approximately 26-acre feet (AC-FT).”

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Water supplied to the Jenkins Water District from Elkhorn Lake is tested frequently to meet or exceed EPA standards ^(2.13). Samples are taken on a regularly scheduled basis by the local water department's certified operator and some are tested locally. Other samples are sent to laboratories certified by the Kentucky Division of Water as approved analytical laboratories. If there is a pipeline break in the distribution system where ground water infiltration may occur, testing can determine if health threats are present. The results of these lab reports are publicly available on the Division of Water website, which shows all the results for drinking water, both positive and negative. If a test reveals the detection of a contaminant beyond the approved safe range the analytical laboratory issues a violation notification to the Jenkins Water Department. Some laboratory contaminants detected, such as e coli, require issuance of a boil advisory to the water customers and a written report of the laboratory findings ^(2.14). (See <http://dep.gateway.ky.gov/DWW/> for info about Jenkins Water District KY0670213)

Drinking Water Violations Jenkins Water System 1999-2018 ^(2.14)		
Violation Code	Violation Type	Number of Violation Events
2456	Halo acetic Acid	15
7500	Failure of Public Notice	5
0300	Filtration	2
0999	Chlorine	2
2920	Precursor Removal	7
7000	Consumer Confidence Rule	1
1040	Nitrates	5
2900-2999	Various Hydrocarbons*	24
*Most violations occurred in one year -1999 for hydrocarbons, Source: KY Division of Water Reports		

Most of these reported violations are over five years old. Only the halo acetic acid levels from chlorine and bromine, likely from over disinfecting the water, may occasionally be a threat to health. Water contaminated with halo acetic acids may cause irritation to your eyes and skin which swimmers often experience from hours in the swimming pool. Long term exposure to halo acetic acid has shown increased cancer rates in lab animals. Chlorination is usually necessary in water treatment, but it can also cause burning eyes, foul odors and bad taste.

According to the city officials and Nesbitt Engineering, ^(2.16) substances used to treat water can result in an EPA water quality violation. Jenkins Water Department chemically treats and disinfects the water from Elkhorn Lake and uses carbon filtering before it leaves the water treatment plant. Coliform test results for 69 samples taken during the 2017-2018 period showed **no** coliform detected. Nor were there detected levels of lead.

U.S. News and World Report data for Letcher County shows county-wide exposure to unsafe drinking water at 13.7% compared to a national rate of 1.1%. Based on the most recent water tests showing little evidence of potential mining or farming risks, there is demonstrably acceptable water quality and few

contaminants. All in all, considering the surface mining and possibility of contaminants, the water test results are much better than might be expected when the variety of pollution challenges to Elkhorn Lake faces are considered. However, focus group participants perceive poor water quality.

The Value of Water Campaign, a collaborative organization created to advocate for increasing support for our nation's water infrastructure, says that "water is essential to all aspects of life." Their position as described in the publication *The Economic Benefits of Investing in the Water Infrastructure*, (www.thevalueofwater.org, 2017)^(2.18) is that not only is water required for health, but that all parts of our economy require water. The benefits of a clean water supply extend from our health to our

economy. They report that in the U.S., 52,000 water systems deliver clean drinking water to the nation, but the water infrastructure is aging and needs new funding to bring many water treatment plants up to EPA standards for drinking water.



In January 2019, the HIA team visited the Jenkins water treatment facility and received a tour conducted by the plant director, Kentucky Certified Water Treatment Plant Operator^(2.13). Our questions about water treatment operations and capacity were all answered professionally and knowledgably based on his decades of experience. The water treatment operations use a combination of disinfection, chemical treatment, filtration and turbidity reduction to remove sediments and improve water quality coming from Elkhorn Lake. The water acidity is constantly monitored by automated pH measurement, and chemicals are added to adjust acidity and alkalinity.

The Jenkins Water System was designed for a maximum 1,000,000 gallons daily operating level, but the Water Department Director reports that current levels are approximately 300,000 gallons per day serving 800 businesses and households or 2,609 people for about 115 gallons per person per day. Nationally, we use about 80-100 gallons of water per person per day. Jenkins also provides water on a wholesale level to the Letcher County Water District for a portion of their customers. When drought conditions are high and the lake levels are low, the Jenkins Water District purchases water from Mountain Water District or pumps water from a nearby flooded abandoned coal mine. The Jenkins Water Director reported infrequently needing to access emergency water supplies because drought is a situation which rarely occurs for Jenkins. However, the possibility of summer drought conditions supports the plan to dredge Elkhorn Lake. Pumping water from an abandoned mine underground coal mine shaft also has its risks. Whichever alternative is less hazardous should be further evaluated.

RESEARCH QUESTION 2.B) LILY PAD AND OTHER VEGETATION REMOVAL

The natural cycle for water lilies is that each year they die and decompose in the bottom of Elkhorn Lake. Decomposition causes algae blooms to increase, which reduces environmental quality for aquatic life because of the competition for oxygen. Breen et al. stated that due to the presence of decaying

matter, such as water lilies, cattails or other vegetation or aquatic life, eutrophication occurs. Then, the water is less suitable for recreational purposes because it is becoming unsightly and developing slime, weed infestation and noxious odor. In the extreme case, eutrophication can reduce water oxygen levels, leading to fish kills, significantly impacting recreational fishing and contributing further to the eutrophication process. Another aquatic plant in Elkhorn Lake is the cattail. Like the water lily, cattails can add to the beauty and aesthetics of a lake or pond. Both water lilies and cattails are aggressive species that grow rapidly and can take over a body of water. When aquatic vegetation plants are plentiful, like they are on Elkhorn Lake, they also consume oxygen from the water causing further anoxia, making it unable to sustain animal life like fish, frogs and toads and microbes that are food for them.

STUDENTS AND TEACHERS AT JENKINS HIGH SCHOOL SAID THAT ALGAE IN THE LAKE SOMETIMES IS WORSE THAN OTHER TIMES AND THAT SOMETIMES THE WATER IS SO DISCOLORED IT STAINS CLOTHES GOING THROUGH THE LAUNDRY. OTHERS SAID THEY NEVER DRINK WATER DIRECTLY FROM THE TAP BUT THEY DID ENJOY HAVING NEW WATER FOUNTAINS IN THE SCHOOL SO THEY COULD FILL THEIR WATER BOTTLES. THEY SAID MORE WATER FOUNTAINS AT THE LAKE WOULD MAKE THE LAKE BETTER FOR RUNNERS AND WALKERS.

Based upon Professor Gail Brion's understanding of the Jenkins situation, removal of the water lilies would likely be

beneficial to the lake health and possibly public health. Professor Gail Brion^(2.7) from the University of Kentucky, College of Public Health, and Department of Environmental Health wrote that "Decomposing lily pads should not have a toxic effect on people, but they do make a stinky mess and can impact fish by stripping oxygen out of the water. It is good to strip them (the lily pads) out of the water. The only potential health impact from lots of decomposing biomaterial I can think of is if the sediments and water are rich with minerals, like arsenic, the anoxic conditions allow for reductions to take place, changing the valence state of metals, as example arsenic into As^{3+} from As^{5+} , which has an impact upon mobility and toxicity. Unless you find lots of metals in the mud that are being released into the water column from the decomposing biomaterial, I couldn't say there is a problem."

Summary of Soil Samples Taken from Elkhorn Lake ^(2.8)				
TCLP Metals	Limits	Sample 1	Sample 2	Sample 3
Mercury	0.2	BDL	BDL	BDL
Arsenic	5	BDL	BDL	BDL
Barium	100	.034	.054	.047
Cadmium	1	BDL	BDL	BDL
Chromium	5	BDL	BDL	BDL
Lead	5	.058	.050	.058
Selenium	1	.054	.053	BDL
Silver	5	BDL	BDL	BDL
TCLP Volatiles		BDL	BDL	BDL
Pesticides		BDL	BDL	BDL
Herbicides		BDL	BDL	BDL
Semi-Volatiles		BDL	BDL	BDL
As defined in 40 CFR Part 261.24 BDL = Below Detectable Limits Toxic Characteristic Leaching Procedure = TCLP Heavy Metals				

Is there another possibility to remove the water lilies and debris without dredging? Some cities such as Piqua, Ohio use equipment designed specifically to remove water manage the water lilies in their reservoir, and they selected a specially made machine from a company that builds and sells floating equipment to remove lily pads ^(2.19). In an interview with a Piqua Water Treatment Operator, he reported a successful eradication program with the machine costing 10% of dredging.

RESEARCH QUESTION 2.C) REMOVING SEDIMENTS BY DREDGING LAKE

Coal mining in Letcher County made the area one of the most productive high-quality coal producing regions in the nation ^(2.10). Most of the mining in Letcher County was underground mining since the size of the coal vein and quality of the coal is usually related to the mineral's depth underground. In the latter part of the twentieth century, after the underground mines were played out and with the advent of new technology, surface mining became more lucrative. Coal companies began removal of the top 800 feet or so of a mountain exposing the coal underneath for easy removal. ^(2.3)

Surface mining also exposes other minerals, such as lead and mercury, and toxic chemicals like arsenic (Fabricant, N.) ^(2.11). The process of surface mining, sometimes called mountain top removal (MTR) leaves the valleys filled with the surface mining waste products which can leach into nearby creeks and rivers and then make their way into drinking water sources. The surface mining near Jenkins sits on much higher ground to the south west of the city and upstream from Elkhorn Lake. There is an irony here that one benefit to mountain top removal is that reclaimed mined land, regraded and reforested after the mining, leaves hundreds of acres of flat land ready for development. In the coalfields, flat land is hard to find. Near Jenkins, most of the former surface mining area is now designated as the Gateway Industrial Park. Several new businesses have located to the industrial park bringing much-needed jobs to the area according to Mayor DePriest.

Mining has been highly regulated for the past half century by the Federal Mine Safety and Health Administration and the Environmental Protection Agency because of pollution concerns and mining disasters, black lung disease and the possible contamination of well water and water reservoirs. Coal ash and coal slurry impoundment failures, a means of storing coal waste byproducts to keep them from contaminating nearby streams, has resulted in some disasters in central Appalachia, leaving water sources contaminated or destroyed. Shiber ^(2.12) reported in 2005 that water samples from homes in 26 central Appalachian counties were analyzed for arsenic. Nearly half of the 179 wells sampled had detectable levels of arsenic. Approximately 6% had levels far exceeding the EPA standards. The incidence of arsenic-related cancers in coal-mining regions is high, and 57% of the well water samples tested in this study had levels over 1 ppb Arsenic. While the Shiber arsenic test results do not currently apply to the Jenkins water system, it does open the possible buried contaminants in Elkhorn Lake. Professor Brion writes: *“Dredging lake sediments is a concern if there are pockets of metals bound up in sediment deposits that dredging exposes and makes mobile by exposure and changing redox conditions (Hags). Are they dredging farther down than they have tested? If so, they might run into some historical wastes (liquid mercury and toxic chemicals which used to be disposed of by dumping). I would want more sampling, and on-going monitoring during dredging, to keep track of what they run into. If the sediments are not toxic themselves, their removal should not raise issues the treatment plant cannot handle with proper monitoring and adjustment of chemical coagulants and water filtration controls.”*



Community survey results conducted of water department customers in the fall of 2018 placed lily pad removal and dam repair as the top priorities. City officials have been on record for at least 10 years that these two concerns, water lilies and dam safety, need to be addressed as soon as possible.

Because of the unknown characteristics of the sediments on the lakebed, dredging could make it risky. Testing was conducted in 2010 to determine the sediment's contents. The summary table above shows the results of sediment samples taken in 2010 from Elkhorn Lake by boring in shallow depths with a hand auger. The samples were from three areas near the head waters of the lake by Nesbitt Engineering ^(2.8) at the request of the city. These sediment samples were taken to the depth of a few feet. The samples were then sent to a testing lab in Mt. Joliet, TN for analysis and the results compared with federal EPA standards.

The test results above show detectable levels for most of the heavy metals and volatile chemicals. Barium, Lead, Selenium were detected in the samples, but none of the metals detected exceeded the level standards set by the EPA. While this is good news and the results also conform to the results from water samples taken from the lake, Professor Brion suggested that additional testing be ongoing during dredging and done to at least the depths of any planned sediment removal. Still, based upon these preliminary results, surface mining contaminants in the sediments and in water samples taken are at safe levels

However, one must be concerned about the sediments that may have washed into Elkhorn Lake after decades of surface mining in upstream areas. Professor Brion, in her communication about contaminants in sediments, described pockets of minerals that accumulate below the lake surface. These contaminants may not disburse over the decades but remain trapped until dredging or major flooding.

Jenkins residents are aware of the water quality problems in the area. The student focus group reflected suspicions about the Jenkins water. Just

to the north of Letcher County is Martin County. The water disaster in Martin County has made national news over the past decades because of coal waste, and it continues to struggle. This issue is mentioned here because it is a cautionary tale, and the Martin County Water System problems are known in Letcher County and in Jenkins.

Coal waste and coal slurry are products of preparation of coal for use, usually done near where the coal was mined. Coal slurry should contain only crushed coal and water. The coal slurry, after mixture with water, can also be transported via pipelines to an end consumer such as a power plant or stored near the mining area. *Food and Water Watch*, ^(2.15) an environmental organization, produced a report about the Martin County, Kentucky coal waste environmental disaster and the subsequent impact to the Martin County Water system. Martin County is northeast of Letcher, adjoining Pike County while Letcher adjoins Pike County to the south. Fortunately, most of the rainwater flows north from Martin County toward the Ohio River. While there is no direct evidence that this nearby water disaster contaminated Elkhorn Creek or tributaries, public perception and concern about Eastern Kentucky water quality exists to this day with frequent reports about how the Martin County Water District struggles (see www.foodandwaterwatch.org). These reports can cause concerns among Jenkins Water System customers as evidenced by the comments from the adults and students interviewed.

HIA RESEARCH ISSUE 2 - WATER QUALITY AND HEALTH

Public trust in the drinking water supply is a major hurdle to overcome around the world because of declining water quality. Even when the tap water is clean and pure, customers may choose less healthy alternative or rely on bottled water. Water department tests show high levels of hydrocarbons in 1996-1999. More recent water quality tests show repeated violations for a variety of contaminants. Water quality could be improved, and the possibility of

In a focus group at Jenkins High School, students and teachers had much to say about the water in Elkhorn Lake and the city water system. Some students talked about the fishing in the lake and having no fear of consuming fish caught in the lake. They did report that debris in the lake caused line entanglements but that the water lilies were not too much of a problem for fishing depending on the type lure used. They recommended removing the debris and some of the trees around the lake to make access better and reduce debris.

selling more water to nearby water districts could produce more income for the city and stave off summertime drought. The dredging of Elkhorn Lake would remove the water lilies and their roots so the plants would not regrow and increase the capacity of the reservoir water to more than the 300 acre-feet the lake is currently rated. Dredging the lake is estimated to cost over \$1 million, and it would require draining the lake for months, causing the city to have to purchase all its water and pump it to the city. This expense may be unreachable because of competing funding priorities within the city and competition for external funding sources. Furthermore, the dredging would unearth the estimated thousands of yards of buried sediments that potentially contain pockets of naturally occurring heavy metals. All sorts of contaminants have possibly accumulated in the lakebed over the last century, although there is no local test evidence to support this possibility. More health-related damage may be due substituting sugar-sweetened beverages for plain tap water because of misperceived poor water quality or mistrust of the water than by toxins or contaminants in in the tap water.

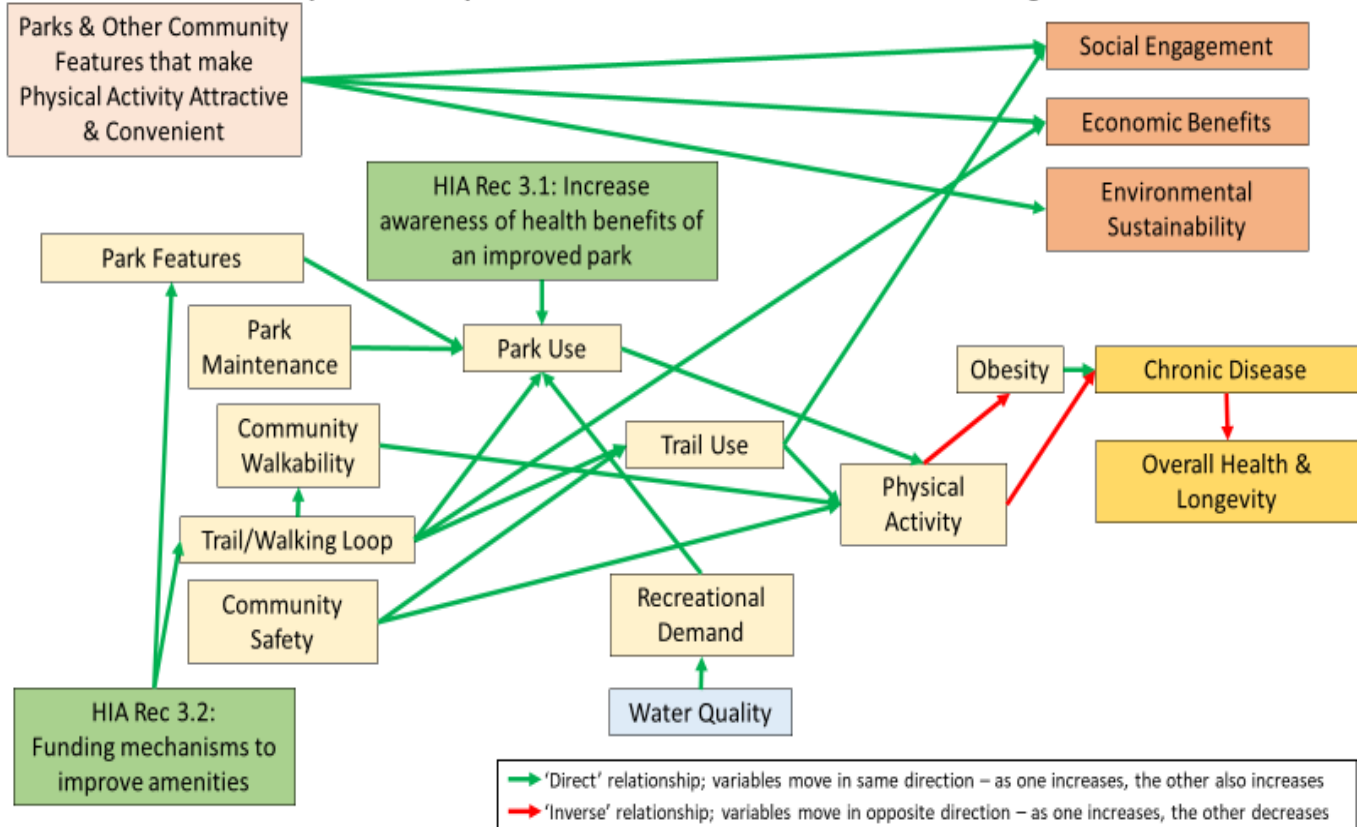
FINDINGS – Public perception of the water quality and trust in the water safety’s importance to health outcomes cannot be overstated. Choosing harmful drinks such as sugar-sweetened beverages as substitutes for water may cause many health conditions. Removing the water lilies and other unwanted debris and vegetation from the lake would improve the water quality. The health benefits of taking less drastic steps than dredging is preferable to waiting until enough funding for dredging become available. The water lilies and debris removal from the lake could be done with modern technology designed for this purpose. Water quality violations have resulted from missed scheduled testing and required notifications to the consumers.

RECOMMENDATION 2.1 - Developing mechanisms for improved community monitoring and frequent consumer notifications about water quality and safety would also likely result in improved public confidence in the water quality. The improved public confidence in the water quality would have the added benefit of improved public health from increased drinking water consumption rather than other less healthy beverages.

RECOMMENDATION 2.2- Creating a community-based organization such as a *Friends of Elkhorn Lake* group comprised of local residents and students to assist the city with communications about water quality improvement planning and lake cleanup activities would have the added benefit of mobilizing the community to take action for managing the water lilies and clearing debris from the shorelines. This Friends of Elkhorn Lake group could become an advocacy group for the city to obtain the funding needed for dredging and other major improvements and assist with lake monitoring and disaster prevention activities.

Research Issue 3 - Park Amenities Influencing Health

Conceptual Pathway for Research Issue 3: Park Amenities Influencing Health



The current Elkhorn Lake Park area in Jenkins consists of a few park benches along the water’s edge, boat ramp, small pier, playground equipment, picnic area, swimming pool, softball field and restaurant. The school system assists the city with the maintenance of the softball field.

Mayor DePriest ^(2.9) would like to expand the park by providing a walking trail around the entire lake. The lake is situated as a focal point for the city and their annual festival, Jenkins Homecoming Days, is held at the base of the dam.

RESEARCH QUESTION 3.A) WALKING TRAILS AND COMMUNITY PHYSICAL ACTIVITY

According to *Community Perceptions of an Urban Park as an Indicator for Quality of Life* ^(3.1), the physical surroundings and socio-economic conditions of urban environments are improved by parks. Additionally, the report cited, “results proved that visiting parks and green spaces for physical fitness or exercises play vital role in improving health of individuals”. The authors of the community perceptions article also cited several other studies which showed similar results to their report.

An exploration of literature was reported in the *International Journal of Behavioral Nutrition and Physical Activity* ^(3.2). This review found good evidence that trails had economic benefits. Sallis et al. concluded that, “Substantial evidence indicated that designing and creating parks, communities, transportation

systems, schools and buildings that make physical activity attractive and convenient is also likely to produce a wide range of additional benefits.” Those benefits found were, “environmental sustainability, economics, and multiple dimensions of health.” Edwards ^(3.3) et al. found that there was a relationship between adolescent park use and the features of the park.

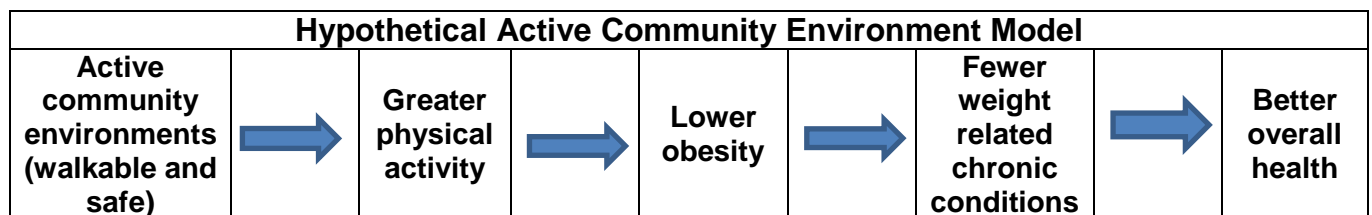
Research conducted by Park, Eyler, Tabek, Valko, and Brownson ^(3.4) in 2017 stated that rural residents were disproportionately affected by rates of inactivity which may be due to limited walkability. Trails could be used to increase in social engagement and for social gatherings. For example, these gatherings could include charity walks and races. They concluded in their research that the survey highlighted a nearly threefold increase in physical activity for residents that use trails. Mowen ^(3.5) et al. found that park renovations could revive the park use as well as the neighborhood.

According to citations in Edwards et al., ^(3.3) several studies have demonstrated the value of parks and recreation as an essential government service. These parks and recreation contributions are enhanced property values, attractive to businesses and increased physical activity. Other studies demonstrate these values Kaczynski and Henderson ^(3.5); Sallis, ^(3.2) Floyd, Rodriguez and Saelens ^(3.3).



A study conducted by Doyle, Kelly-Schwartz, Schlossberg and Stockard ^(3.7) examined the hypothesized causal chain of active community environments and health by looking at the relationship of walkable and safe environments to indicators of health. Overall, their results suggested that if planners are to develop communities that promote physical activities and better health, they should consider elements of both walkability and safety in their designs.

While the city maintains the park, the amenities look aged, and the geese that visit the area are beautiful to watch, but they are messy and can be territorial, as they are known to chase those utilizing the park. To assist with these issues with the geese, a previous Mayor, Mayor Dixon, worked with the city council to approve a policy and a sign in the park so the residents would not feed the geese. The policy of not feeding the ducks is not monitored, and the sign could no longer be located on the grounds when a walk through was conducted.



According to Mayor DePriest, during the summer, the park usage is high because there are individuals fishing, swimming at the pool and utilizing the playground equipment and picnic shelter for birthdays and family get-togethers. In the past, the City worked with other organizations such as the Boys Club, to provide kayaks for rent. The proceeds from this endeavor would be used to benefit to the Boys Club.

RESEARCH QUESTION 3.B) RECREATION & PHYSICAL ACTIVITIES

In 2015, the U.S. Surgeon General issued a Call to Action to promote walking and walkable communities ^(3.11). The call to action highlighted what the individual could do, as well as what local government could do in an effort to increase physical activity. Breen ^(2.1) reported from Ireland on whether recreational trips to waterways are connected to changes in water quality. Four categories of recreational users were considered: fishermen, boaters, other water sports (e.g. rowing, swimming, canoeing, etc.) and land-based activities at water sites, specifically walking and cycling. The Breen analysis found evidence that higher levels of recreational demand (i.e., trips of longer duration) occur at sites with better water quality.

Research conducted by Cohen et al ^(3.6) reported that parks with walking loops had 80% more users and accrued 90% more metabolic equivalent hours than parks without walking loops. The odds of a park being occupied were 2.6 times higher when a walking loop was present. The current configuration of the park does not contain a walking track or path. Some of the area surrounding the park has a sidewalk but most of the area surrounding the lake consists of grassy banks and hillside. The lake can be utilized for fishing and non-motorized boating. As the lake serves as the City's water reservoir it cannot be utilized for swimming or motor-powered boats. According to research by Edwards, Hooper, Knuiman, Foster and Giles-Corrit ^(3.3), adolescent park use is based on *"availability, proximity; park size; adolescent perceptions of the environment; quality; and use by friends."* To conduct their research, they created an adolescent attractiveness score as a predictor of park use for physical activity. They concluded that *"park use for physical activity by adolescents was associated with seven features: presence of a skate park, walking paths, barbeques, picnic table, public access toilets, lighting around courts and equipment, and number of trees (greater than or equal to 25)."*

Elkhorn Lake Improvement Project

A KRADD survey was conducted with Jenkins high school students in December 2018. The students were asked to indicate what improvement/amenities they would most likely use. Their responses are below:

Jenkins Student Survey Results, October 2018. 64 responses to online survey question	
Which of these Elkhorn Lake improvements do you think Jenkins residents would benefit from most should additional resources become available?	
Possible Improvements	Rank Order
Restrooms for easier access	32.81%
Fishing access around Lake	28.13%
Dog park	28.13%
Walking trail around Elkhorn Lake	25.00%
Outdoor education area for Jenkins schools' students	25.00%
Biking Trail around Elkhorn Lake	23.44%
Park benches all around lake	20.31%
Improved city water quality	15.63%
Park exercise equipment	15.63%
Picnic tables	15.63%
More access for canoes and kayaks on lake	14.06%
Fix dam leakage to improve community safety	14.06%
Removal of water lilies to improve water quality and lake activities	14.06%
Bandstand for community concerts	9.38%
Water fountains	9.38%
Community garden to grow healthy foods	7.81%
Soccer field	7.81%
Relocation of Public Works Building to expand park below dam	6.25%

According to research conducted by Malecki et al. ^(3,8), the results of their literature review shown below demonstrate a growing body of evidence that many aspects of the built and social environments can impact health behaviors and outcomes. The Malecki et al. research examined features in both urban and rural communities with the overall goal to provide data on neighborhood-level physical features, and social factors, emphasizing those related to physical activity and other health behaviors. Through their research, they identified five domains. They concluded that exercise facilities, enjoyable scenery, frequency of seeing others exercise, presence of and satisfaction with recreation facilities, and sidewalks have been linked to levels of physical activity. The literature review is summarized as the Wisconsin Assessment of Social and Built Environment (WASBE). The data extrapolated in WASBE can be reflected to the population in Jenkins.

Wisconsin Assessment of Social and Built Environment ^(3.8)		
Domain	Description of Features	Outcomes Assessed
Neighborhood characteristics	Features related to the sensory experience of neighborhood including aesthetics, presence of shade trees, presence of publicly available amenities such as seating/benches or public art and presence of neighborhood signs	Obesity, physical activity, activity-friendly communities, walking to work, walkability, active commuting to school, active transport and depression (Citations – 21)
Transportation environment	Features that facilitate safe and efficient movement and active transportation throughout the environment including traffic volume, street type, presence of sidewalks and bike lanes and presence of public transit	Obesity, activity-friendly communities, walking to work, urban bicycling and walking (Citations – 9)
Destination/Land Use	Factors concerning the availability or accessibility of nearby facilities whether residential or non-residential and the diversity of land use	Active commuting to school, obesity, active transport, physical activity, mental and physical self-reported quality of life, self-rated health, urban bicycling and walking (Citations – 19)
Social Environment	Aspects related to neighborhood social capital and presence of a protective social community including presence of individuals partaking in positive activities, social gathering places and safety from crime	Obesity, physical activity, activity-friendly communities, walkability, active commuting to school and health-related quality of life (Citations – 16)
Connectivity	Features related to directness of travel routes including intersection density, average block length and presence of pedestrian crosswalks, sidewalks, and bike lanes	Active commuting to school, active transport (Citations – 8)

Public parks are among the most common places for physical activity. In addition to park and user characteristics, neighborhood characteristics are important to explain park use. Also, the promotion of active use of existing parks can be a promising strategy to increase physical activity (Van Dyck et al.). (3.9).

RESEARCH QUESTION 3.C) RECREATIONAL WATER USES INCREASE ACTIVITY



I love the fact that Elkhorn Lake provides our local community members with the opportunity to relax and enjoy hobbies such as fishing.

Photo by Kristen Thacker Jenkins High School 10th Grade

Direct observation of the Elkhorn Lake Park was not conducted as part of this HIA since the timing of the assessment research occurred during the winter months when outdoor activity is at its minimum.

Studies have been conducted on evaluating the outcomes or impacts of park renovations and have suggested that the park renovations can increase visitation and physical activity (Veitch, Ball, Crawford, Abbott, & Salmon, 2012). (3.13).

Disease Related to Physical Inactivity in Letcher County		
	Letcher County	Kentucky
Prevalence of Asthma	18%	16%
Prevalence of Diabetes	24%	13%
Prevalence of Hypertension	59%	39%
All Cancer Death Rate	210	198
Heart Disease Death Rate	286	200
Stroke Death Rate	48	41
From Kentucky Health Facts 2017		

Elkhorn Lake Improvement Project

According to the 2017 Kentucky Health Facts, Letcher County exceeds the State rate for asthma, diabetes and hypertension. Additionally, Letcher County experiences higher deaths related to cancer, heart disease and strokes than the entire state. The primary causes of death are cardiovascular disease and lung cancer in Letcher County. The data show that physical inactivity is a health risk for residents of Letcher.

In an interview with Mayor Todd DePriest, he indicated that during the summer months the park was filled with people utilizing the lake for fishing, as well as picnics, family events and children enjoying the pool and playground equipment. Mayor DePriest indicated during the peak months that the parking areas would be at capacity. As part of this assessment park, usage tools were reviewed but were not completed since the weather was not conducive to an accurate count of the usage of the park. For part of the assessment, KRADD staff worked with the Jenkins school system to have youth conduct a photo contest. The entries are part of this document along with the student comments about what their photos meant to them. The students were from the middle and high school of Jenkins Independent Schools.

In October 2018, KRADD and the city of Jenkins conducted a community survey with Jenkins water customers, and over 100 people responded. The question asked was which aspect would best benefit Jenkins by the Elkhorn Lake Improvement Project. Some questions related to park improvements and some to park amenities. Of the amenities, the results are shown in the table above. According to the results most of those respondents are in favor of walking trails around the lake.

Community Survey Responses on Elkhorn Lake Park Amenities	Percentage responded Yes
Walking trail around lake	55%
Fishing access around lake	44%
Park benches	43%
Picnic tables	42%
More access for canoes/kayaks	30%
Biking trail around lake	29%
Outdoor education area	18%
Community garden	17%
Park exercise equipment	15%
Bandstand	12%

Research conducted by Loukaitou-Sideris and Sideris ^(3.10) revealed the most significant factor attracting children to parks generally is active recreation facilities and the park's landscape, as well as

park's size, active recreation programs and well maintained, safe parks. Additionally, their research showed that 20% of children do not utilize parks. The reasons expressed were that they lacked interest in the activities, lacked time for them and their parents had concerns about park safety. Evidence collected in Jenkins was not able to either support or refute this conclusion as our survey tool did not specifically address this issue.

HIA RESEARCH ISSUE 3 - PARK AMENITIES AND HEALTH

The Elkhorn Lake Park area in Jenkins consists of a few park benches along the water's edge, a boat ramp, a small pier, playground equipment, picnic area, swimming pool, softball field and restaurant. Mayor DePriest^(3.1) would like to expand the park by providing a walking trail around the entire lake. The lake is situated as a focal point for the city. There exists a large volume of scientific literature on the community benefits of urban or neighborhood parks such as at Elkhorn Lake, if they include a variety of features. The social determinants of health such as physical activity levels, stress relieving recreation, social interactions and healthy lifestyles would improve the overall health behaviors and longevity of the people of Jenkins. The literature reviewed demonstrates a growing body of evidence supporting the idea that many aspects of the built and social environment can impact health behaviors and outcomes. Public parks are among the most common places for outdoor physical activity, which improve health.

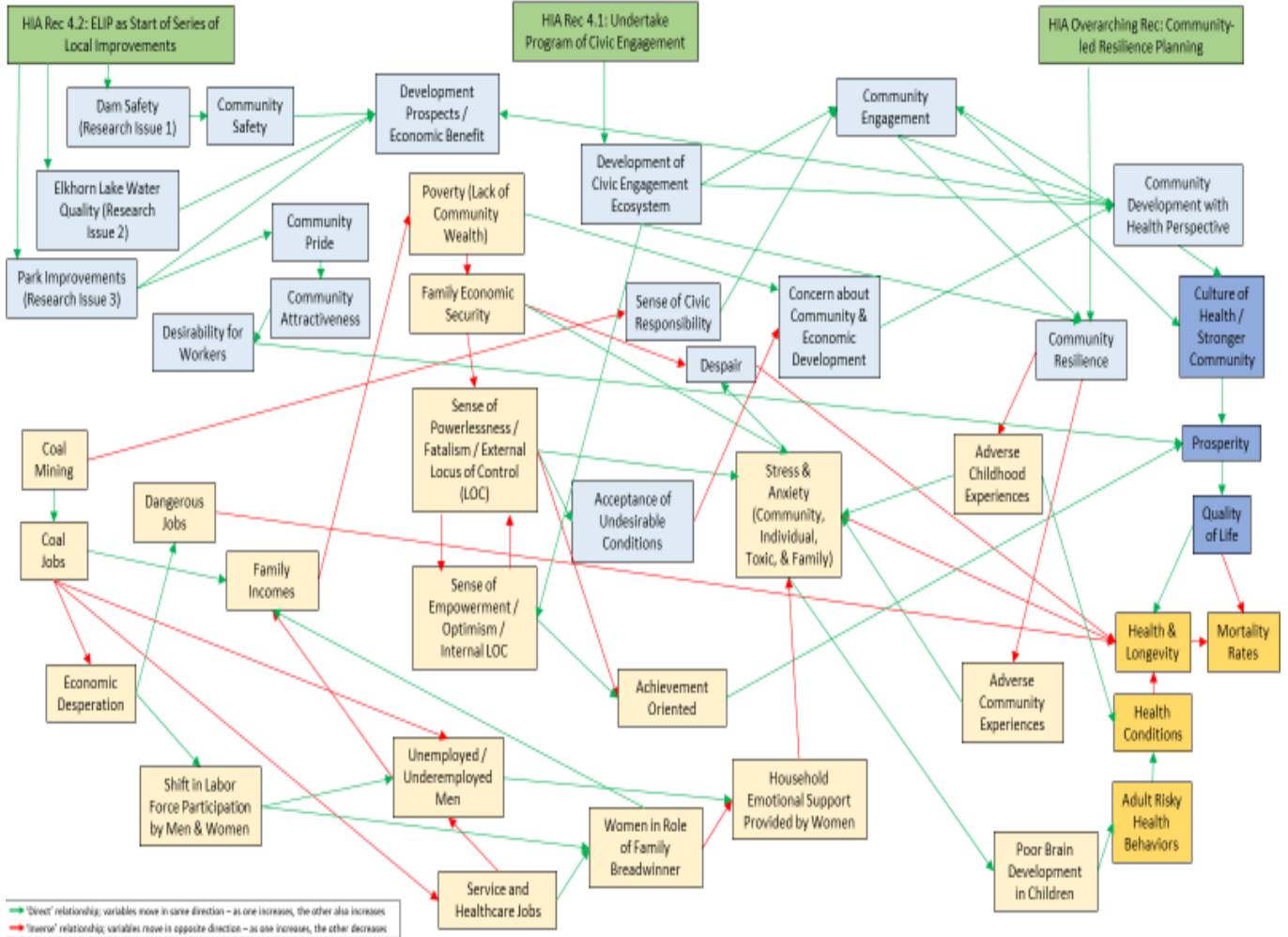
FINDINGS – Certain health behaviors can be improved through the utilization of a park and amenities offered at the park influence utilization.

RECOMMENDATION 3.1 - The community and City Council should work with the local health department to increase awareness of the health effects of an improved park and the amenities offered by utilizing the Surgeon General's Call to Action to promote walking and walkable communities.

RECOMMENDATION 3.2– While the data shows promise for health benefits by the expansion of a park walking trail, and the cost of a walking trail around the entire Elkhorn Lake has been incorporated in the Abandoned Mine Lands applications, these improvements have not been considered as an individual project. The City leaders should consider separating various components of the Elkhorn Lake Improvement Project and planning other funding mechanisms or grant opportunities to strategically improve amenities in the park. Community engagement and mobilization would be a key component park to improvements. The proposed Friends of Elkhorn Lake could be a key to this mobilization.

Research Question 4 - Health Impacts of Elkhorn Lake Improvement Project on Community Development

Conceptual Pathway for Research Issue 4: Health Impacts of ELIP on Community Development



HEALTH AND COMMUNITY DEVELOPMENT

During the twenty-first century, the decline in all types of coal mining has continued in Letcher County. The surface and underground mines have played out, and many coal companies have gone bankrupt or left the area altogether. The resulting loss of jobs and the good incomes that mining produced has caused Letcher County to be among the most impoverished areas economically in Southeastern Kentucky and the United States. The loss of the community wealth has brought with it the loss of family economic security, and it has increased their sense of powerlessness, stress and despair. Now more than ever, communities like Jenkins are concerned with community and economic development.

The people who settled in the mountains were a hardy and fiercely independent people who were well suited to the brutally tough jobs, such as the underground coal mining, surface mining, and the timber industry. The coal miners and loggers were often fierce and aggressive, protecting themselves and their

families, giving rise to the violent tradition of clannish feuds. Mining jobs usually paid well, many times more than minimum wages jobs that have grown in the area since the decline of mining. People of Jenkins are used to taking dangerous mining and logging jobs, sacrificing their health and longevity in order to survive. So, it is not surprising that central Appalachian health statistics show shorter lifespans and higher rates of mortality from many causes of death.

Poverty and despair coupled with stress are powerful detractors to overall health and among the strongest determinants to the high rates of a variety of illnesses. Amanda Cassidy ^(4.1) in *Health Affairs* describes how organizations working in low income neighborhoods benefit the community more when they do not solely focus on one dimension like housing, jobs, new buildings or transportation corridors. She writes that collaboration with public health helps to expose the myriad of social determinants to health. So, when community development policy includes health policy, stronger communities are created. The HIA approach taken here is that economic development, infrastructure, community organizing, and local resources are as important to health, as health is to community prosperity and quality of life.

An example of using a Health Impact Assessment as adjunct to community development policy was demonstrated by the Health Resources in Action partnership with the Massachusetts Department of Housing and Community Development ^(4.2). The public policy proposal concerned implementing a Community Investment Tax Credit (CITC), so community developers would have an incentive to invest in low-income neighborhoods. The CITC legislation was informed of the critical pathways, linking health and development activities such as housing, commercial buildings, small business, training programs and community cohesiveness. The result of the CITC legislation was a broader definition of community development so health impacts were included. Developers applying for the CITC showed their project linkages to health determinants.

RESEARCH QUESTION 4.A) COMMUNITY DEVELOPMENT AND HEALTH IMPACTS

The people of southeast Kentucky now see new opportunities for community development as paramount. If a goal is to create a culture of health in Jenkins and Appalachia, fostering community engagement and economic development must be a part of it. Complicating matters, we must remember Jenkins was a coal camp, a company town. Everything was owned and operated by the succession of coal companies that developed the region. The jobs, the stores, the housing, law enforcement and even the miner's pay, a currency called script, were controlled by out of state or in some cases international coal companies.

One accounting of the Appalachian cultural sociology, based on the colonization of the coal camps by foreign owners, is described by Gaventa ^(4.3) in *Power and Powerlessness, Quiescence and Rebellion in an Appalachian Valley*. Gaventa explained the reluctance of many central Appalachians to participate in the democratic process that endures today. His description of the people of the region said "*The picture presented is one of quiescence amongst poverty and inequality. Whether as citizen worker or potential protester, the Appalachian appears to illustrate the quiescence described in social science on lower and*

working classes in America generally.” Gaventa cited another writer, Watkins ^(4.4), saying in *Coal and Men*, that the Appalachian coal miner has a severe set of adjustment problems. The most severe of the set is the “failure to develop a strong sense of civic responsibility.”

Watkins illustrated the difference between coal miners in Appalachia and in South Wales in his 1934 study. “*Both groups of miners are splendid fellows in their own ways. The American miner is clever tinkering with an automobile or radio and can talk knowledgeably about the house, property, insurance or other investments. The Welsh miner is not personally interested in investments or house property. You will find him interested in economic or political theories and problems.*” Gaventa related these basic discrepancies to the miner’s differences in the coal camp’s ownership, differential power and powerlessness. Expecting community engagement in an Appalachian region may be challenged by the history and traditions of the region. The process of creating a culture of health, while necessary, is made even more difficult by the historical lack of reward for engagement. Do changes in the basic economic structures in the region, caused by the loss of mining jobs, make history irrelevant? Are there opportunities presenting themselves now to improve communities and make their residents healthier?

Many Appalachians may say no to change. Jack Weller ^(4.19) calls this tendency fatalism. “*While traditionalism can thwart the planners and molders of industry, education, and society in general, fatalism can so stultify a people that passive resignation becomes the approved norm, and acceptance of undesirable conditions becomes the way of life,*” said Weller in *Yesterday's People: Life in Contemporary Appalachia*.

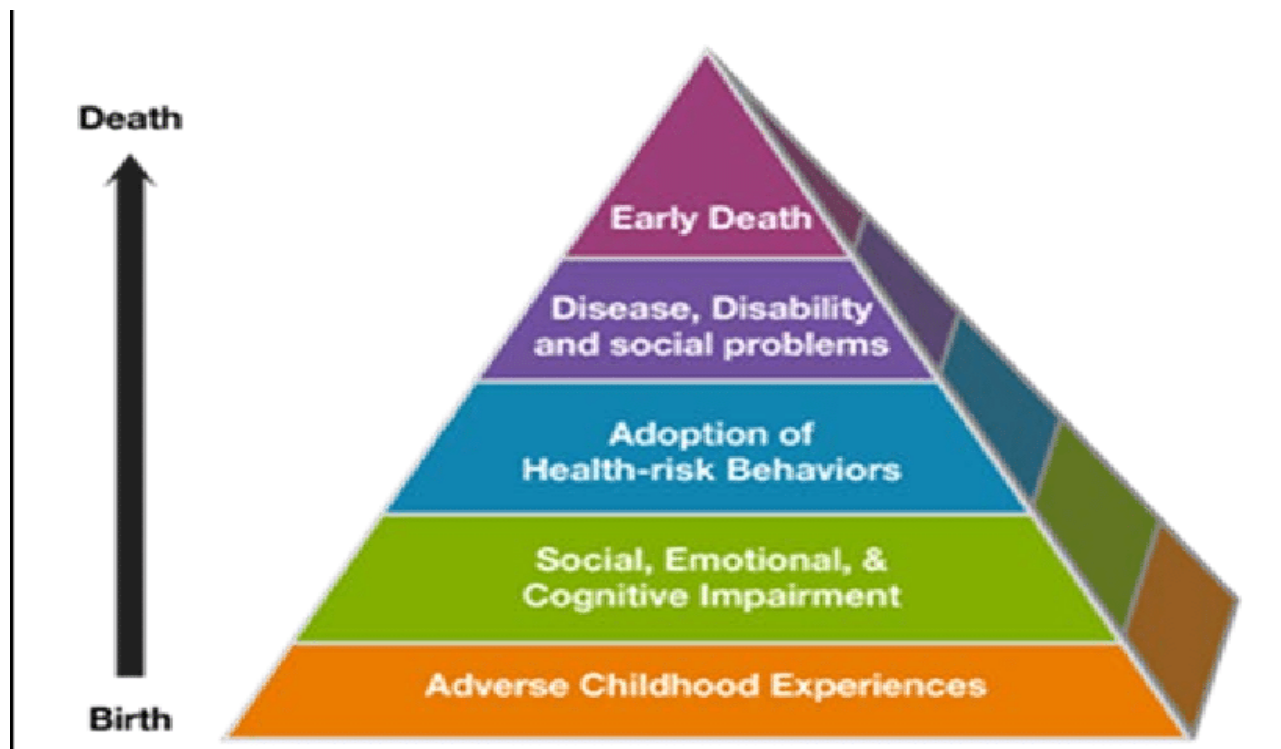
Psychologist Julian Rotter ^(4.6) has taken another viewpoint to explain the lack of civic participation. Rotter called the personality state he researched “Locus of Control” (LOC). Rotter approached LOC as a basic aspect of motivation and as a significant personality variable. Locus of Control referred to the extent to which individuals believe they personally can control events affecting them (internal control), or whether events in their lives are uncontrollable by themselves and controlled by some external force (external control). These two LOC beliefs are said to shape an individual’s worldview, and by extension, a whole group of people, as having either an internal or external LOC. Thus, the individual or a social group could essentially have a fatalistic or optimistic basic belief system. Appalachians are often characterized as fatalistic, such as by Weller, with external locus of control, while persons with an internal LOC are more achievement oriented. Rotter’s theoretical underpinning of the LOC personality trait has evolved since 1954, because Locus of Control has since become a frequent aspect of personality studies in Appalachia, and around the world. One study looked at *Locus of Control, Academic Achievement, and Follow Through in Appalachia* ^(4.7) and found differences between social class and gender and correlations between locus of control and achievement.

This HIA has previously mentioned efforts over the past four decades regarding the exchange of correspondence between current and previous mayors with dozens of public officials and experts in dam safety, which identified actions that would improve community safety and possibly enhance

development. The recommendations in response from these public officials and experts suggested the city itself could take actions to improve community development prospects and reduce anxiety. Past efforts to get outside assistance have not yielded the hoped-for results.

Harriett Fraad ^(4.8) a self-described feminist and radical activist, explored the changing economic and psychological topography of America. Metaphorically speaking, she sees the U.S. as having been flooded with social disasters. Basic social changes have flowed together to devastate the American economic, psychological and social landscape. *“Each is fed by related streams; each contributes its own force to the torrent. The American dream of each generation surpassing the previous generation in real wages, i.e. what their wages could buy, as well as the dream of an intact family, a steady job and a home, have all disappeared.”* Economic desperation has pushed men and women into different roles in the labor force to increase money for the household. The living standard of Americans deteriorated psychologically as well, which added more stress to households. Women, who in the Appalachian culture provided most of the emotional support that made households warm and comfortable for men and children, were not as available because they have become the primary breadwinner in many Appalachian households. In Appalachia, the loss of coal mining jobs has meant that more new jobs are available only in service and healthcare industries, jobs frequently occupied by women, with males likely unemployed or under employed if not trained and re-educated for other occupations. These role changes cause a shift in family dynamics and could increase family stress.

Theoretical Model of Adverse Childhood Experiences by Felitti et al. ^(4.9)



Coming from another discipline’s perspective on public and behavioral health is the more recent research on childhood, family, community environments and toxic stress by Felitti et al. ^(4.9). Over the past twenty years, this research on the correlates between Adverse Childhood Experiences (ACEs) and adult medical conditions has identified childhood trauma and adult health behaviors. The more ACEs a person has experienced in his or her childhood, the more correlations linking various health conditions and behaviors in adulthood.

Adult health conditions and behaviors linked to childhood experiences in the United States	
Emotional abuse	Mother treated violently
Physical abuse	Household substance abuse
Sexual abuse	Household mental illness
Physical neglect	Incarcerated family member
Emotional neglect	Parental separation or divorce
<i>From Improving the Adverse Childhood Experiences Scale, Finkelhor et al. 2012 ^(4.10)</i>	

Shown here are some of the health conditions of Kentucky adults which the Kentucky Department of Public Health has linked to Adverse Childhood Experiences. Department of Public Health found the link between ACEs and adult health through a special statewide Behavior Risk Factor Surveillance System survey. This statewide telephone survey asked ACEs related questions and about current health conditions and behaviors that contribute to poor health outcomes.

These Kentucky health outcomes likely apply to Letcher County and Jenkins as well.

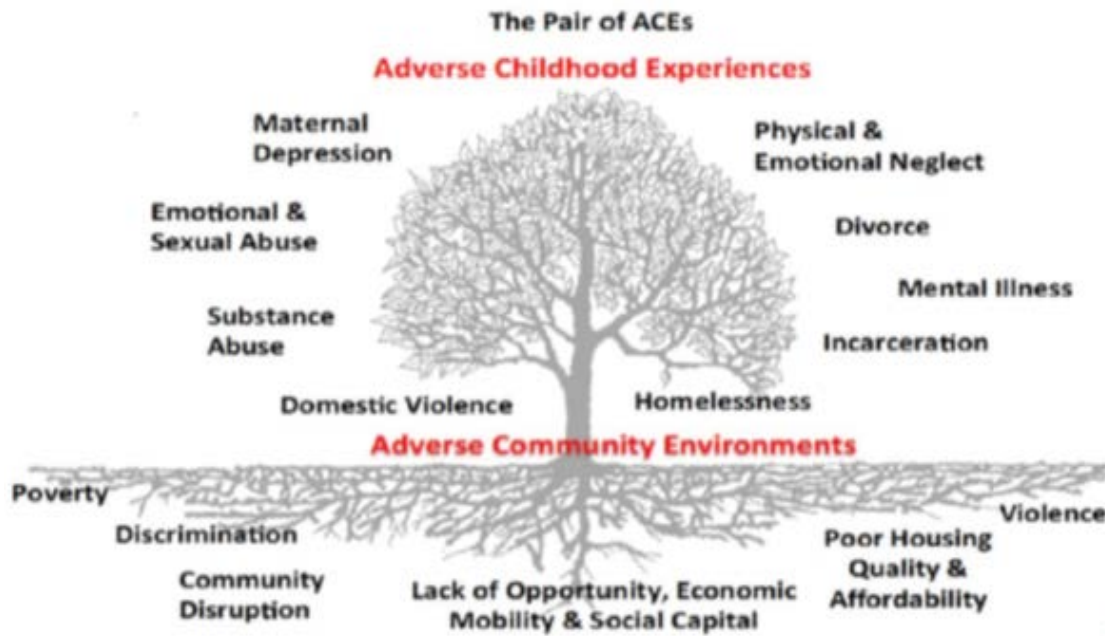
Adult Health Behaviors and Conditions Linked to ACEs in Kentucky		
Smoking	COPD	Asthma
Binge Drinking	Pulmonary Disease	Arthritis
Obesity	Depression	HIV

There is no published evidence for the number of ACEs in Letcher County due to sampling size considerations. There are county level results for poverty, domestic violence and mortality rates for poisoning deaths, all higher in Letcher County than elsewhere. More research is needed for ascertaining the ACEs for Jenkins with certainty. Despite the lack of specific data for Jenkins and Letcher County, research shows that improving childhood stressors would likely improve adult health.

Ellis and Dietz ^(4.18) have found that the individual's number of ACEs combined with their number of *Adverse Community Environments* cause toxic stress. For some, the toxic stress is enough to affect child brain and neurological development. Impaired brains are then predicating adult health risk behaviors, so how do we impact upon these negative experiences and environments to improve the individual's and community's health for Jenkins, Kentucky?

Dietz and Ellis describe tools and techniques to **Build Community Resilience (BCR)**. Ellis and Dietz explain that BCR is the essential factor in improving public health outcomes. More on Building Community Resilience is presented later in this report.

Community Environments Presenting Health Risks ^(4.18)	
Adverse Community Environment	Present in Letcher County?
Neighborhoods with violent crime,	X
High poverty rate	X
Unaffordable or unsafe homes	X
Lack of access to groceries	X
Drug overdose rates	X
Source: Community Commons.org	

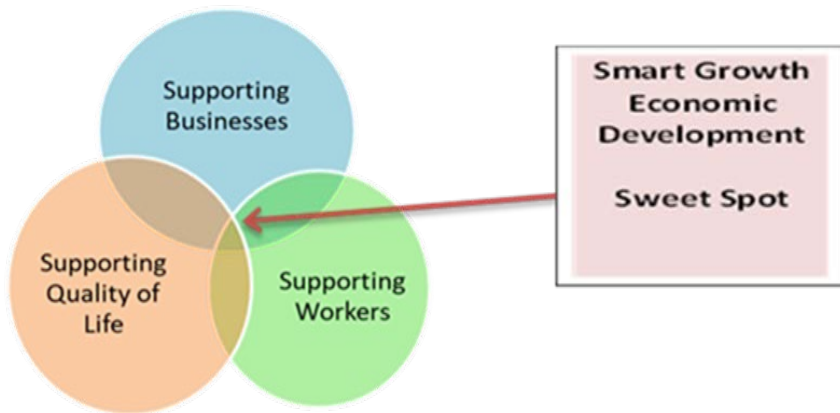


Improving Community Ecosystems - Ben Goldfarb ^(4.22) and the Wallace Global Fund (WGF) produced a report on the growing importance of small-town civic engagement. The WGF report shows the shifting national consciousness from rural areas to urban areas. Small towns are increasingly feeling

the impacts of the changing social and political urban emphasis. Goldfarb calls for supporting the development of what he calls “*civic engagement ecosystems*.” These ecosystems will keep the small town from extinction. Goldfarb sees a role for at least seven community development actors, two of which are Public Health and Community Development Organizations like KRADD. The others are main street business owners, family farmers, renewable energy providers, the faith community and housing developers.

RESEARCH QUESTION 4.B) ELKHORN LAKE DAM IMPROVEMENTS AND COMMUNITY DEVELOPMENT

The U.S. Environmental Protection Agency ^(4.13) has produced a document suggesting a more comprehensive approach to community development. In the *Framework for Creating a Smart Growth Economic Development Strategy: A Tool for Small Cities and Towns*, the EPA proposes three primary components to developing a plan for the city: 1) Supporting Business, 2) Supporting Workers and 3) Supporting Quality of Life.



The Smart Growth Economic Development model has goal areas that the Elkhorn Lake Improvement Project impact. The component of Supporting Businesses is impacted by the dam since the downtown area is where the flood waters would go in the event of a breach. The Supporting the Workers component is

impacted by the business, workers and community residents who are below the dam. Finally, improving the Quality of Life of the community could be reducing anxiety about the dam. So, will improving the structural integrity of the dam enhance Jenkins development potential? Concerns expressed by community residents in focus groups and surveys about the uncertainty of life near the dam may have hindered development. Making improvements would also improve public confidence and reduce stress, according to Jenkins residents interviewed.

Tingey-Holyoak, Pisaniello, and Dam ^(4.20) at the Centre for Comparative Water Policies and Laws in Australia have created a set of tools for cities to use to have the policies in place to reduce impact before and after a dam breach. Their dam safety policy models and guidelines are derived from international best practices. The model policies are linked with procedures intended to aid government to assure the community that there is an acceptable level of risk to the dam and to quell community concerns. The ELIP disaster preparedness plan could reference this set of policies as a resource if U.S. example could not be identified.

RESEARCH QUESTION 4.C) WATER QUALITY IMPROVEMENTS AND COMMUNITY DEVELOPMENT

For the mining operations near Jenkins, creation of the Elkhorn Lake and Dam served several purposes. The History of Jenkins, Kentucky compiled in 1973 by Elizabeth Dramczyk ^(2.10) describes when and how the town and mines were developed. Besides providing a clean water source for the coal camp, Elkhorn Lake also provided flowing water for the hydroelectric plant at the base of the dam. This electrical power served Jenkins and helped mining by operating pumps, and it provided lighting for the underground coal miners and lit their homes. In order to construct the 600 or more houses, saw mills were needed, as well as a brick plant, the railroad to move the coal to markets and the wood supports and bracing for the coal shafts. The Elkhorn Lake hydroelectric plans supported these operations and helped build the City of Jenkins.

Improving water quality increased the property values of the town surrounding Lake Hume ^(2.5), and it also created a positive impact on the local economy because of the visitors to the lake area. Presently, the shoreline at Elkhorn Lake and the water lilies inhibit fishing, boating and access. Current plans to remove the unwanted aquatic plants in the lake will likely improve water quality and increase recreational use on the lake for boating and kayaking. About half of the lake is inaccessible from the shore because of a steep hillside and trees and shrubs growing on the hillside. Landscaping to increase access is planned.

While local people express concerns about water quality, making some of the improvements discussed here would possibly increase interest in Jenkins as a city for property development and new businesses. Before indoor running water was available from Elkhorn Lake, local people had no choice but untreated well water. Drinking water quality has improved since the 1912 dam construction, despite the past century surface mining, increased use of pesticides and herbicides, and limited availability of wastewater treatment systems. The recent Martin County Water District disaster has caused the reputation of Eastern Kentucky water quality to suffer. The Jenkins water treatment facilities make the water consumable. Taking the next steps in the drinking water purification process means that Jenkins' water supply could become exemplary and attractive for drinking, cooking and other household uses. The next steps require removing the aquatic plants, submerged debris and contaminated sediments.

RESEARCH QUESTION 4.D) CITY ATTRACTIVENESS AND PARKS IMPACT ON DEVELOPMENT

Sallis et al. ^(3.2) conducted a major review of the literature involving 418 articles about the co-benefits of designing communities for physical activities. Sallis et al. stated in their review that *“Many decisions affecting physical activity environments occur at the local government level. Though mayors, city council members, and other officials work every day to balance competing interests, they likely do not consider that environments supporting physical activity could produce additional benefits for their communities.”* Activity-friendly environments help reverse the tide of the global epidemic of physical inactivity. Sallis et al. identified five physical activity settings: parks/open space/trails, urban design, transportation,

schools and workplaces/buildings. Six potential outcomes or co-benefits were searched: physical health, mental health, social benefits, safety/injury prevention, environmental sustainability and economics. All physical activity settings showed the potential to contribute to some type of co-benefits. Specific environmental features with the strongest evidence of multiple co-benefits were: 1) park proximity, 2) mixed land use, 3) trees/greenery, 4) accessibility and street connectivity, 5) building design and 6) workplace physical activity policies/programs.

They found substantial evidence that designing community environments that make physical activity attractive and convenient is likely to produce additional important benefits such as to the local economy. The *economic benefits* of activity-supporting built and social environments were discussed. As this following chart shows, not only were there physical health co-benefits to parks, trails and open spaces, there were also benefits to mental health, social benefits, environmental sustainability, safety and economic benefits. In the Sallis et al. research, we find strong supporting evidence from their literature review that open spaces, parks and trails have health and economic benefits. ELIP could benefit Jenkins in several ways, including economically, mentally and physically.

Co-Benefits of Parks, Trails, and Open Spaces ^(3.2)						
Built Environment Attribute	Physical Health	Mental Health	Social Benefits	Environmental Sustainability	Safety	Economic Benefits
Proximity	+++	+++	+++	++	++	+
Design Feature	+		+			
Trails						++
Activity Promotions		+	+	+	+	
Graffiti, litter, etc.					+	
Public Gardens			+		+	
Strength of Evidence: Low +, Medium ++, High +++						

One initiative by the Appalachian Regional Commission ^(4.17) is the Downtown Revitalization Project that is a component of the Promise Zone effort to improve communities impacted by the loss of the coal industry. The ARC Promise Zone philosophy is that targeting specific areas helps make communities more attractive to potential businesses, shoppers and local citizens. ARC believes cheerful downtown areas help lift the mood of small communities. The ELIP park improvements could seek this funding as part of the community revitalization efforts to improve the Public Works area and remove the debris from the toe of the dam, which would expand the park area and make downtown Jenkins more attractive, thereby increasing community pride.

The AARP ^(4.12) has published a set of free online documents they call the “AARP Roadmap to Livability.” The six-part toolkit shows how communities can make their town attractive to all persons, not just retired persons. They developed the toolkit based upon their research about what attracts people to a community to move, live and work there. The City of Jenkins could use these tools to help with community development since they include activities identified in this HIA as beneficial to them. Making Jenkins more livable is a goal of community development.

The AARP Roadmap's six tools include modules on:

- 1) Livability, why livability is important to a town's success;
- 2) Holding listening sessions to foster community engagement;
- 3) Housing services;
- 4) Transportation;
- 5) Health services; and
- 6) Economic development

Chris Elkins ^(4.15) said it eloquently when he editorialized in the Northeast Mississippi Daily Journal: *"Once upon a time, people went where the jobs were. They didn't pay a whole lot of attention to the attractiveness and amenities of the places that had those jobs. Today, however, the young business and professional people that cities need to ensure economic and social vitality often decide on a place they'd like to live and then look for work there. They're looking for a community with a unique character, aesthetic appeal and a variety of activities and amenities."*

Elkins quoted Joe Fratesi, program director with the Stennis Institute of Government at Mississippi State University, who put it this way: *"People are choosing where to live based on how they feel in that community."* This means sub-standard building design; neglected commercial areas, deteriorating neighborhoods and the cluttered chaotic appearance of so many urban strips are deterrents to drawing new residents. A community that doesn't provide the kind of ambiance people want will have a harder time attracting industry in the future.

Jennings and Bamkole ^(4.21) developed a model of the *Relationship between Social Cohesion and Urban Green Space*. They explained that the social determinants of health have a central place in any community's model of public health promotion and physical and mental health. Their community development model promotes the social determinants of health, social cohesion and social capital using public green space, such as Elkhorn Lake Park.

RESILIENCE, HEALTH AND COMMUNITY DEVELOPMENT - In February 2019, the Appalachian Regional Commission ^(4.11) issued a guidebook and technical report called *Strengthening Economic Resilience*. The authors of these ARC reports took a combination approach of examining expert's opinions about economic resilience, identifying exemplary case studies, and conducting empirical analysis of the resilience factors. The technical report focused on the regression analysis of indicators of economic functioning during the recession of 2008.

The economic indicator's dependent variable was jobs lost, gained or retained during the downswing in employment. Using number of jobs as the dependent variable means that the quality of jobs is not studied. Most people in coal producing regions like Letcher County would say that going from a high

paying job in the coal industry to a minimum wage job in food service is not progress. The ARC report did find that having a proportionately younger (age 25-44) workforce, more ethnic diversity, more in-migration and less out-migration, as well as more in-commuting, and a larger population with greater shares of college graduates are all important factors associated with greater resilience. None of these factors are present in Letcher County or Jenkins. The ARC resilience approach would recommend policies that improve on the resilience factors. The Community/Health factor included in the ARC analysis found community college, health practitioners and Internet broadband with the strongest significance with recreational opportunities and natural amenities also factors. Letcher County has broadband, a community college and a hospital and clinics but is still short on health practitioners. Recreational opportunities and natural amenities like those at Elkhorn Lake could be better developed. The ARC report results were synthesized into eight best practices for growing economic resilience in the Appalachian Region:

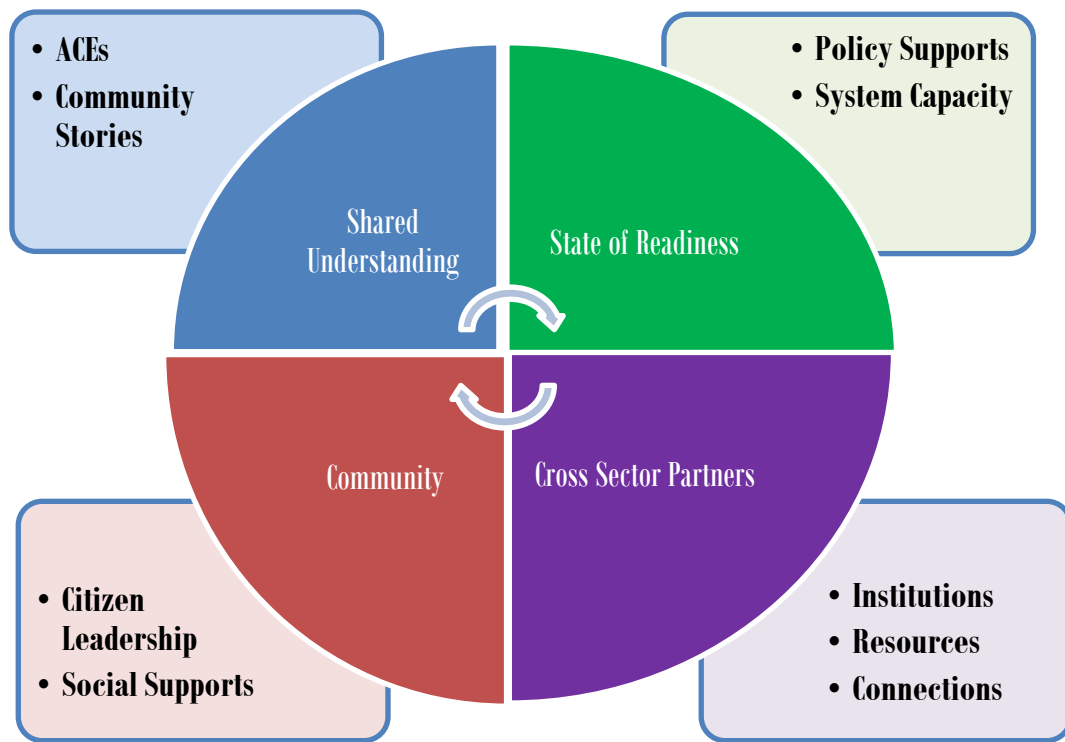
- Invest in education, technology, infrastructure and broadband.
- Engage the community over the long term.
- Create communities where people want to live.
- Grow youth engagement and next-generation leadership.
- Identify and grow the assets in the community and region.
- Build networks and foster collaboration.
- Move multiple sectors forward for economic development to grow value chains.
- Cultivate entrepreneurs and develop resources for business start-ups.

BUILDING COMMUNITY RESILIENCE –The GWU Milliken Center for Public Health has developed a Building Community Resilience Model (BCR) based upon undoing the harm done to children by adverse community experiences and adverse community environments. BCR builds upon the natural resilience in humans and aims higher by providing a framework for collaboration and coordination between large systems and community members. BCR stresses building strategic partnerships between various sectors to build stronger, healthier and more resilient communities. Community resilience relies on supporting buffers in communities and families, which are protective factors. This resilience helps by protecting individuals from the accumulation of toxic stress due to ACEs. When children experience the ACEs in adverse community environments, the effects are compounded and often lead to poor health outcomes. The work of BCR is to build community and family networks that foster resilience against the chronic stressors that can become toxic thereby altering a child’s development and long-term health.

The ELIP has revealed components of community stress and threats to health and well-being that contribute to overall health problems such as cardiovascular disease, cancer rates and behavioral health disorders. The BCR Center at GWU has tools and techniques to measure the ACEs and the Adverse Community Environments. Using these tools, the resilience networks that need strengthening and support can be identified for Jenkins. Looking at Letcher County through the ACEs lens may possibly reveal high level stress due to both adverse childhood experiences and many characteristics of an adverse community environment, compounding the ACEs effects. Consequently, the long-term

community development solution for improved health and economy for Letcher County may require high levels of community research, engagement and mobilization. BCR is a promising approach, but there are likely too many co-occurring community economic and social conditions for any single institution or agency to use BCR to overcome this confluence of challenges. Since Gaventa ^(4.3) describes Appalachian communities as not seeing themselves as powerful and feeling a lack of ability to change their circumstances, helping the people of Jenkins and other southeast Kentucky communities to understand that they *do* have the power to take charge of their own lives might be a good role for KRADD. With the BCR model the community goes through a 1) Process of readiness assessment; 2) Cross sector partner development; 3) Shared understanding of ACES and resilience; and 4) Community building including organizational and citizen leadership. Some cities in the United States including Louisville, Kentucky and Cincinnati, Ohio have already adopted this approach to resilience.

Building Community Resilience



In Australia, the rural communities led by Buikstra ^(4.5) from the University of South Queensland have developed their own resilience model. Based upon theory in the community development and social impact assessment literature, their model provides insight into qualities and assets of communities that enable them to develop effectively or to adapt to major changes. They identified resilience assets using participatory action research.

These eleven resilience assets are:

1. Social networks and support;

2. Positive outlook;
3. Learning;
4. Early experiences;
5. Environment and lifestyle;
6. Infrastructure and support services;
7. Sense of purpose;
8. Diverse and innovative economy;
9. embracing differences;
10. Beliefs; and
11. Leadership.

The Australian definition of Community Resilience is “*the capacity of community members to engage in projects of coordinated action within the context of their community, despite events and structures that constrain such projects.*” This Australian model relies upon communities to come together and, with leadership, find their own ways to solve their own problems. This is a dramatic shift from the characterization of Appalachian miners presented by the author of *Power and Quiescence in Appalachia*.

HIA RESEARCH ISSUE 4 - COMMUNITY DEVELOPMENT AND HEALTH

The people of southeast Kentucky see new opportunities for community development as paramount. If a goal is to create a culture of health in Jenkins and Appalachia, fostering community engagement and economic development must be a part of it. Some see reluctance by many central Appalachians to participate in the democratic process to create increased prosperity. One accounting of the Appalachian cultural sociology, based on the colonization of the coal camps by international owners, was described as power and powerlessness, and another as the failure to develop a strong sense of civic responsibility. The community development researchers and theorists reviewed here understand that overcoming poverty is an essential component of health promotion and community development. The review of the community development literature includes diverse sources such as the AARP, the EPA and the ARC as well as Australian sources. Common themes from U.S. and international sources are community engagement and community pride. Health promotion theorists have attributed some adult health problems and lack of social adjustment to adverse experiences in childhood caused by family stress and poor community environments. The research conducted for this HIA supports building community resilience along with strategies to engage the community in development plans with the result being healthier people and more prosperous communities.

FINDINGS - Models for community development presented include health as a key component, but they also call for engagement of the civic ecosystems or major institutions in the process. These institutions such as banks, churches and health care agencies should provide leadership to improve civic participation. A Mississippi journalist said it best when he wrote “*Frills No Longer*” in describing community development. The journalist contended that today, jobs come to where the workers choose to live rather than workers going to distant jobs. The workers choose where they live by *how they feel* about a place. With the long history, traditions and culture of Appalachia, people love the land they have worked so hard to build. They do not want to leave their family and community just

for a job where they might have long commutes daily or on weekends. Making communities attractive to workers and businesses leads to improved quality of life and better health outcomes.

RECOMMENDATION 4.1 - The City of Jenkins' leaders and other community leaders need to undertake a program of civic engagement that clarifies and sets priorities for the city. A strategic planning process that clarifies the major goals for the city and actions to take in the near term which look at the overall needs but also concentrate on what the residents could accomplish themselves without depending upon outside assistance or funding. This kind of grassroots initiative would strengthen the community and make it a healthier place to attract new opportunities in the long term.

RECOMMENDATION 4.2 - The City of Jenkins should make the Elkhorn Lake Improvement Project the first component to a series of local improvements to make it more attractive to residents and businesses. A team of residents, formed as an action committee, would identify which priority steps must be taken to improve the dam, park, water quality, and creating Jenkins ownership of the actions. Involving the city government, banks, churches, schools and businesses in identifying their individual and collective parts will help assure success.

Collectively, these recommendations would not only improve community safety, reduce stress, improve water quality, build upon a beautiful centerpiece for the city and make the city more attractive for development but would deliver the added benefit of creating a more hopeful community spirit.

OVERARCHING RECOMMENDATION: COMMUNITY RESILIENCE PLAN FOR JENKINS

The overarching recommendation and goal for Jenkins is to use the local community residents, led by a group of community leaders, to develop a resilience plan for Jenkins. The Elkhorn Lake Improvement Project Goals are necessary and worthy, but relying on external entities to solve the problems in Jenkins is a poor strategy for progress. Funding from some major government source is unlikely as an all-encompassing funding mechanism. But lesser changes and those “low hanging fruit” could be identified and acted upon more quickly with individualized funding mechanisms from local and external sources.

This ELIP Health Impact Assessment could be fodder for the Jenkins Community Resilience Plan team. The social, health and economic indicators shown here could become useful for developing the Jenkins Community Resilience Plan. Transformation of a city beset with a wide variety of challenging issues will not be easy or fast, but it can be done with persistence and belief in the power that resides within the community to control its own destiny. Jenkins can demonstrate to its residents and the region that the city has a new vision for the future as a culture of health and prosperity. Promoting health and a hopeful, positive outlook will make the city easier to market to investors and its citizens.

WHAT DOES ALL THIS MEAN FOR KRADD?

KRADD has the opportunity through its network of members to provide leadership and training to create a new future for the region. Each KRADD member could learn from each other the ways to develop a community resilience plan for their communities, which expands the definition of community

development to include health, economic development and development of a stronger community. Training in Building Community Resilience, health in all policies, community engagement of current and future community leaders and other key players or stakeholders could, over time, lift southeast Kentucky out of the doldrums it now faces.

Looking at the community indicators of health, economy, social factors and individual mental health for Letcher County and all the KRADD counties shows many challenges, so many in fact that it appears daunting. To overcome this apparently overwhelming variety of challenges requires transformational leadership and transformational change, and these come from within Jenkins. Many small change projects will gradually overcome the plethora of challenges. As a wise one said when asked how to eat an elephant, “One bite at a time.”

So where does one begin? Examining the models in detail discussed briefly here and then selecting one or two that KRADD could bring to the forefront in southeast Kentucky could be a start. Looking at the “health in all policies” approach embedded in the Health Impact Assessment tool would help the community development approach chosen to keep from being simply targeting the economy. Creating a strong, healthy community where people *feel good and want to work and live* is the goal.

GUIDING PRINCIPLES

Following these guiding principles as a basic framework would facilitate community development based upon the HIA findings:

1. Use a definition of community development that goes beyond housing and jobs to include health;
2. Incentivize developers to have a broader community perspective;
3. Empower local persons to be active community leaders;
4. Support ideas that reflect internal controls;
5. Recognize the changing roles for men and women without demeaning anyone;
6. Support resilience in children and the community;
7. Engage the community institutions as leaders in the process;
8. Develop local policies that reflect local challenges and priorities;
9. Revitalize downtown areas and make the community more attractive; and
10. Create an attractive community where people *feel good* about living there.

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Elkhorn Lake Improvement Project

Attachments

Elkhorn Lake Improvement Project Survey

The City of Jenkins currently plans to make improvements to Elkhorn Lake and Dam. While the Elkhorn Lake improvements may provide local economic benefits, the other major interests are improving the health and safety of city residents. Please complete this survey to help us plan our Improvements.

What is the Elkhorn Lake Project? Mayor DePriest and Jenkins city officials currently seek funding from the Abandoned Mine Lands pilot project and other sources to improve Elkhorn Lake city reservoir, and the area surrounding Elkhorn Lake. This would involve major improvements to this vital community resource. The questions below are designed to help the planners make recommendations so the city officials are selective about the types of improvements *should the resources become available*. **If you wish to make additional comments about any question, use the back of the survey.**

- 1) Is Jenkins a place that supports city improvements? Yes ; Unsure ; No
- 2) Would Elkhorn Lake benefit from major improvements? Yes ; Unsure ; No
- 3) Which of these Elkhorn Lake improvements do you think Jenkins residents would benefit from most should additional resources become available? Mark as many as you please)

Walking trail around lake ; biking trail around lake ; Fishing access around lake
Relocation of public works buildings ; Fix dam leakage & safety ; Removal of water lilies
More access for canoes and kayaks ; Improved city water quality ; Outdoor education area ; Community garden
Restrooms ; Park benches ; Picnic tables ; Bandstand . More lake area housing ; Park exercise equipment ; other: _____.

- 4) Which **three** Elkhorn Lake Improvements are most vital to the interests of the City of Jenkins residents should additional resources become available? (Mark no **more than three** below)?

Walking trail around lake ; biking trail around lake ; Fishing access around lake
Relocation of public works buildings ; Fix dam leakage & safety ; Removal of water lilies
More access for canoes and kayaks ; Improved city water quality ; Outdoor education area ; Community garden
Restrooms ; Park benches ; Picnic tables ; Bandstand . More lake area housing ; Park exercise equipment ; other _____.

- 5) Do you think Jenkins should connect with area hiking trails? Yes ; Unsure ; No .
- 6) Are you a Jenkins resident or landowner? Yes ; No .
- 7) Do you live at Elkhorn Lake or below dam? Yes, near lake ; Yes, below dam ; No .
- 8) Do you believe Elkhorn Lake improvements would attract more people to park area resulting in health benefits to the residents and improve the local economy? Yes ; Unsure ; No .
- 9) How old are you? Less than 18 ; 18-35 ; 36-55 ; 56-70 ; 71+ .
- 10) Would you be willing to serve on an Elkhorn Lake Advisory Committee? Yes ; No
If yes, contact information: Name: _____ phone: _____ email: _____
- 11) Would you volunteer in other ways to help with the Elkhorn Lake Project? Yes ; No
If yes, how might you help and contact information: _____

Other Comments: _____
Thank you for your participation in this City of Jenkins Community Survey.
Please return to City Hall by October 10, 2018.

Elkhorn Lake Improvement Project

Jenkins Community Survey Summary (800 surveys sent with bills to city water customers)							
22-Oct-18	Age Range				86 responses		
	18-35	36-55	56-70	71+	Sig.	Total	
Jenkins supports city improvements	83.3%	81.3%	86.1%	87.5%	p<.000	84.9%	
Elkhorn Lake Improvements Needed	100.0%	100.0%	94.4%	91.7%	p<.000	94.2%	
Types of Improvements Needed							
	Rank	18-35	36-55	56-70	71+	Sig.	Total
Remove Water Lilies	1	66.7	75.0	97.2	91.7	P<.005	88.4%
Fix Dam	2	50.0	75.0	80.6	79.2		75.7%
Water Quality Imp.	3	50.0	37.5	72.2	58.3		58.1
Walking Trail	4	66.7	68.8	58.3	41.7		53.5
Restrooms	5	50.0	56.3	61.1	20.8	P<.05	47.7
Fishing Access	6	33.3	68.8	41.7	37.5		43.0
Picnic Tables	7	16.7	50.0	41.7	37.5		38.4
Park Benches	8	33.3	37.5	44.4	37.5		39.5
Canoes and Kayaks	9	16.7	50.0	27.8	20.8		27.9
Bike Trail	10	16.7	50.0	23.2	25.0		26.7
Relocate Public Works	11	16.7	31.3	27.8	20.8		27.9
Outdoor Education	13	16.7	12.5	19.4	12.5		15.1
Community Gardens	13	0.0	18.8	13.9	16.7		15.1
Park Exercise Equip.	14	33.3	12.5	16.7	4.2		12.8
Bandstand	15	0.0	12.5	11.1	12.5		10.9
Housing	16	16.7	12.5	2.8	8.3		7.0

Jenkins Student Survey Results

October 2018. 64 responses to online survey question

Which of these Elkhorn Lake improvements do you think Jenkins residents would benefit from most should additional resources become available?

(Mark as many as you please)

Restrooms for easier access	32.81%
Fishing Access around Lake	28.13%
Dog park	28.13%
Walking trail around Elkhorn Lake	25.00%
Outdoor education area for Jenkins schools' students	25.00%
Biking Trail around Elkhorn Lake	23.44%
Park benches all around lake	20.31%
Improved city water quality	15.63%
Park exercise equipment	15.63%
Picnic tables	15.63%
More access for canoes and kayaks on lake	14.06%
Fix dam leakage to improve community safety	14.06%
Removal of water lilies to improve water quality and lake activities	14.06%
Bandstand for community concerts	9.38%
Water fountains	9.38%
Community Garden to grow healthy foods	7.81%
Soccer field	7.81%
Relocation of Public Works Building to expand park below dam	6.25%

How Healthy is Letcher County, Kentucky? U.S. News and World Report: Selected Ratings of Healthiest Counties, 2018		
Health Determinants	U.S. rate	Letcher Co. (24,519 pop.)
Overall Score (rating 0 to 100 best)	52.3	24
Population Health		15
- Life Expectancy	77.9 years	72.4 years
- Poor or Fair Health	16.1%	23.2 %
- Deaths of Despair	38.5/100,000	76.6/100,000
- Adults without Leisure Time Activities	24.3%	32.7%
Education		25
- Idle Youth not in school or working	2.9%	8.1%
- Per pupil expenditures	\$11,730	\$10,368
Public Safety- Fire Police		45
- Per Capita Spending	\$239	\$58
- First Responders	0.7/1000	0.4/1000
Economy		22
- Poverty Rate	16.0%	28.4%
- Business Growth Rate	8.3%	9.1%
- Unemployment	5.0%	11.9%
Environment		65
- Unsafe Drinking Water	1.1%	13.2%
- Population Near Park	14.6%	20.6%
- Walkability Index	6.10	4.32
- Walkable Destination	4.8%	0.0%
Housing		39
- Net migration	+1.0%	-3.2%
- Vacancy Rate	2.6%	10.2%
- Flood Zone Housing	3.8%	14.1%
Food & Nutrition		30
- Obesity	31.0%	38.4%
- Diabetes	9.3%	15.3%
- Access to Large Grocery	21.6%	0.0%
- Adults Without Enough Fruits & Veg	79.2%	82.0%

HIA Reporting, Communications and Dissemination

Goal 1 of the Elkhorn Lake Project HIA: The Elkhorn Lake Project Health Impact Assessment will inform the Elkhorn Lake Project Plan and revisions to the corresponding AML Pilot Project application with new information from a broader human health perspective which would otherwise not be included through environmental or other assessments.

Associated desired outcome: Funding support for Elkhorn Lake Project is secured and final plans consider recommended actions that maximize the community's health.

1) Communications Audience: Possible funders for Elkhorn Lake Project

Objective: Funding agencies will see the wisdom of investing in an attractive city with residents seeking to improve health and community prosperity.

Strategy: Provide funding agencies the information to understand the relationships between the Elkhorn Lake Project and the health and safety of residents and the attractiveness of the city to business developments.

Tactics:

- Type of product/format of communication:
 - a. One pager updated to include new information – Timeline: as available
 - b. Website info www.elkhornlakeproject.org – Timeline: Completed
 - c. Written report – Timeline: June 2019
 - d. Grant application(s) tailored to the Elkhorn Lake project goals – Timeline: November 2018
- Key messages
 - a. Health and safety of Jenkins is interconnected with improvements to the Elkhorn Lake Park and dam structural integrity.
 - b. Help us avert tragedy and improve the quality of life in Jenkins.
- Best messengers: Todd DePriest, Mayor; Bennie McCall, City Manager; Roger Profitt, HIA Advisory Committee; and Donna Hardin, KRADD CEDS
- Best types of data to illustrate those messages:
 - a. Literature review on research questions
 - b. State Data Reports, Water Quality and Dam Inspection Reports
 - c. Stories from focus groups of seniors and students
 - d. Statement from city engineer
 - e. City officials' interviews
 - f. Grant narrative that summarizes HIA findings based on data and evidence
- Distribution methods:
 - a. Applications to funding agency with custom package of information
- Special considerations:
 - a. Identification of barriers to communication with funding agencies
 - b. Identification of appropriate potential funding sources.
- Possible narrative change looking to make as part of our communications:
 - a. Health and lifestyle, Elkhorn Lake Project and prosperity linked to job creation
 - b. Health and job creation are the future.
 - c. Messengers: Todd DePriest, Mayor; Bennie McCall, City Manager; Roger Profitt, HIA Advisory Committee; Donna Hardin, KRADD CEDS and Shana Agee, KRADD Public Information Specialist
 - d. Stories to illustrate our data about Jenkins and Elkhorn Lake.

Goal 2 of the Elkhorn Lake Project HIA: The Elkhorn Lake Project Health Impact Assessment will provide opportunities for public engagement with, and citizen participation in, the planning process for the Elkhorn Lake Project and the development of the AML Pilot Project proposal.

Elkhorn Lake Improvement Project

Associated desired outcome: This HIA approach serves as a model for community and stakeholder engagement for future projects in the region.

2) Communications Audience: Jenkins area residents

Objective: Jenkins residents will become inspired and mobilized around dam improvements, park improvements, and community attractiveness to enhance health and prosperity.

Strategy: Provide information from the HIA since some Jenkins residents may not have the information to understand how the Elkhorn Lake Project is connected to the community's health and safety now and to the attractiveness of the city for business development in the future.

Tactics:

- Type of product/format/timeline of communication
 - a. One pager fact sheet infographic – Timeline: start of HIA
 - b. Press releases – Timeline: start of HIA, ongoing, and at HIA completion
 - c. Website info – Timeline: ongoing and at HIA completion
 - d. Written reports – Timeline: June 2019
 - e. Videos and photos – Timeline: as available
- Key messages:
 - a. Prosperity for Jenkins is intertwined with health, attractiveness of the city, and community members
 - b. Dam improvements will impact on public safety and water quality
- Best messengers: Todd DePriest, Mayor; Roger Profitt, HIA Advisory Committee; Bennie McCall, City Manager; and Eileen Sanders, HIA Advisory Committee
- Best types of data to illustrate those messages:
 - a. Literature review on research questions
 - b. State Data Reports, Water Quality and Dam Inspection Reports
 - c. Stories from focus groups of seniors and students
 - d. Statement from city engineer
 - e. City officials' interviews
- Distribution methods:
 - a. WYMT, Hazard TV
 - b. EKB-TV, Pikeville
 - c. Website: www.elkhornlakeproject.org
 - d. Presentations at KRADD meetings
 - e. Media events at City Hall to release info and reports
 - f. Emails to persons from Jenkins and KRADD
- Special considerations (communication barriers):
 - a. Barriers to communication with Jenkins from lack of local radio, TV, newspaper.
 - b. Local cable: Intermountain Cable
 - c. Direct communications through water bills of business card size alert to website
- Narrative change you're looking to make as part of your communications:
 - a. Health, lifestyle, Elkhorn Lake and prosperity linked to job creation
 - b. Coal is the glorious past; health and innovation is the future
 - c. Messengers: Todd DePriest, Mayor; Roger Profitt, HIA Advisory Committee; Bennie McCall, City Manager; Eileen Sanders, HIA Advisory Committee and students

Goal 3 of the Elkhorn Lake Project HIA: The Elkhorn Lake Project Health Impact Assessment will assist KRADD members and partners to see the potential health impacts of public policy decisions they make in their roles as governmental and community leaders.

Associated desired outcome: A "Health in All Policies" philosophy becomes a regular part of decision making and results in measurable population health improvements.

3) Communications Audience: KRADD members

Elkhorn Lake Improvement Project

Objective: KRADD members will become inspired and mobilized around using Health Impact Assessment to improve health and prosperity across the region.

Strategy: KRADD members may not have the information to understand the relationships between the Health Impact Assessment and the community to business developments.

Tactics:

- Type of product/format of communication:
 - a. One-page fact sheet infographic – Timeline: Completed February 2018
 - b. Website information – Timeline: January 2019 and ongoing
 - c. Written report – Timeline: Upon completion June 2019
 - d. Video and photos – Timeline: As available
 - e. Policy statement – Timeline: February 2018
 - f. Presentations to KRADD members, in small groups or one-on-one – Timeline: Completed April 2018 and May 2018
- Key messages:
 - a. Prosperity for Kentucky River Region is intertwined with community health, attractiveness, and resources for local government
 - b. Health impact assessment is a tool to help achieve prosperity
- Best messenger: Todd DePriest, Mayor; David Mathews, Ph.D., HIA; and Donna Hardin, KRADD CEDS
- Best types of data to illustrate those messages:
 - a. Literature review on research questions
 - b. Stories from key messengers
 - c. Statement from city engineer
 - d. Elected officials' interviews
 - e. HIA process and impact evaluations
 - f. Focus group responses
- Distribution methods:
 - a. Website: www.elkhornlakeproject.org and Facebook page
 - b. Presentations at KRADD meetings
 - c. Emails to KRADD members
- Special considerations:
 - a. New local officials without knowledge of Health Impact Assessment
- Narrative change you're looking to make as part of your communications.
 - a. Health, lifestyle, policy decisions, and prosperity are linked to job creation
 - b. Messengers: Todd DePriest, Mayor; David Mathews, Ph.D.; and Donna Hardin, KRADD CEDS
 - c. Helpful Stories about Jenkins and Elkhorn Lake.

Goal 4 of the Elkhorn Lake Project HIA: The Elkhorn Lake Project Health Impact Assessment will place potential health impacts into context of longer-term community development strategies and opportunities, such as community, economic development and housing.

Associated desired outcome: Improved alignment of development practice and health promotion.

4) Communications Audience: Potential Business Developers

Objective: Potential investors recognize Jenkins as a place of opportunity as a result of local improvements informed by HIA.

Strategy: Include messaging stressing government emphasis on health and quality of life in business and marketing.

Tactics:

- Type of product/format of communication:

Elkhorn Lake Improvement Project

- a. One-page fact sheet infographic about Health Impact Assessment results in our region – Timeline: October 2019
- b. County and city websites and social media – Timeline: October 2019
- Key messages:
 - a. Working to improve health, attractiveness of communities and community members lifestyle
- Best messenger: KRADD members
- Best types of data to illustrate those messages:
 - a. Stories from focus groups of residents
 - b. Local government officials' interviews
- Distribution methods:
 - a. Websites for each local government
 - b. Presentations by local government personnel to business developers
 - c. Presentations by City Officials and real estate developer presentations to business developers
- Special considerations
 - a. Limited marketing resources
 - b. Limited marketing through industrial park boards
- Narrative change you're looking to make as part of your communications.
 - a. Health, lifestyle and prosperity linked to job creation
 - b. Messengers: Local government officials, Rotary Club, Kiwanis

Kentucky River Area Development District

Draft Health Impact Assessment: Policy Statement

Abstract

Health impact assessment (HIA) is a systematic process to determine the potential effects of a proposed policy, plan, program or project on the health of a population and the distribution of those effects within the population. HIA also provides recommendations on monitoring and managing these effects. The strength of HIA rests upon five principles: democracy, equity, ethical use of evidence, sustainable development and a comprehensive view of health. By facilitating the consideration of health in short- and long-term decision making, KRADD contributes to the regional economic development. This policy statement supports institutionalizing HIA at the regional and local levels; building capacity for HIA and increasing HIA research and evaluation.

Problem Statement

Today's public health problems result not from a single causative agent, but rather from several interdependent determinants that are often embedded in complex public policy issues. Disciplines and sectors traditionally outside the domain of health, social determinants of health such as transportation, education, industrial development, and agriculture, are generally unaccountable to health outcomes and have many competing priorities. To address the social determinants of health that contribute to poor health and vast health disparities, regional and local leaders must find ways to incorporate concern for and accountability to health outcomes into a wide range of decision making and public policies.

The KRADD approach encourages the consideration of health impacts in decision making, especially public policy. In July 2011, the Institute of Medicine recommended that federal, state and local decision makers adopt this approach. While health considerations can be included in a decision without a formal HIA process, this is mostly likely when the health impacts are familiar, and the decision-making process is transparent. HIA systematically introduces a community-based, holistic understanding of health into decision-making processes for both public- and private-sector activities. It establishes health and well-being as a priority, recognizing that it is the ultimate outcome of economic, social, and political conditions. Widespread HIA could raise public awareness of the broad scope of factors affecting health, emphasize the links between our region's health and its economic and social strength, and help policymakers elevate health considerations to the same plane as other outcomes of concern.

Need for the HIA process: The strength of the HIA framework lies in its core principles and its potential to affect policy development. HIA requires that teams of individuals from various disciplines pool their talents with members of the community to develop and implement strategies for change; thus, the process offers the opportunity to overcome disciplinary and sectoral silos, address root causes of health disparities, and bring more resources to primary prevention for public health. HIA proceeds through six steps. Practice guidelines and standards have helped to refine the practice so that the process itself also adds value to decision making. The HIA steps are as follows.

- 1. Screening:** During screening, practitioners (who may include staff from health departments, foundations, private organizations, or others with training in HIA methodology) briefly describe potential connections between the proposed policy, program, plan or project and the health of affected communities and individuals.
- 2. Scoping:** Practitioners also outline the research methodology, including data sources and analysis plans. Scoping determines the nature of community involvement and the depth of the assessment.
- 3. Assessment:** Data may be qualitative or quantitative and from a broad range of fields. Analyses should also incorporate stakeholder perspectives.
- 4. Recommendations:** HIA does not prescribe a decision. Recommendations specify the parties or stakeholders that should be responsible for implementation.
- 5. Reporting:** The HIA report describes in detail all the first four steps, including the proposed policy, plan or program; stakeholders and their involvement; data sources and analysis; findings; recommendations; and a plan for monitoring and evaluation.
- 6. Monitoring and evaluation:** The HIA process, impact of the HIA recommendations and health outcomes after implementation should be evaluated.

Guiding Principles

Democracy: In general, the public is not authentically engaged in all the decisions relevant to their health, while decision makers are not fully informed about all potential outcomes. Deliberation—defined as “judicious argument, critical listening and earnest decision-making”—can yield benefits for both individuals and society, including self-efficacy, community identity and civic engagement.

Equity: The adverse health effects of public policy fall disproportionately on vulnerable groups. Ultimately, socioeconomic status, influenced by education, occupation and income, underlies determinants that account for 80% of premature mortality. HIA focuses on the equity impacts of decisions and incorporates equity into the formal decision-making process.

Ethical use of evidence: Analyses of policies, plans and programs often lack rigor, transparency and impartiality and do not always make use of the best available evidence. HIA values both rigor and full and impartial participation, recognizing that community questions about the research, methods and relevance create a necessary balance between community control and scientific accuracy. HIA relies on the precautionary principle, which specifies that in lieu of scientific certainty, the best available evidence should be used in making decisions.

Comprehensive and sustainable approaches: Policies influencing food security, a living wage, healthy housing, safe and healthy work environments and education have far-reaching impacts on health. These may be direct, short-term impacts or more distal influences, for example through job creation and other economic factors. Decision makers in these other sectors, whether elected officials or agency administrators, may not pay significant attention to health outcomes due to a long list of competing priorities and limited accountability.

Recommendations Statement

Institutionalize HIA to improve policy and program decision making: There is great potential for HIA to add value to routine governmental decision making. The sensitization provided by the national Healthy Places Acts of 2006 and 2007, there is an opportunity to institutionalize HIA in regional and local decision making without interfering with economic progress. Institutionalizing HIA at the state level would also increase health considerations in planning. For example, using local stakeholders to monitor adherence to HIA recommendations could hold agencies more closely accountable for health outcomes. Emphasizing monitoring and evaluation as a necessary component of HIA will also help practitioners ensure their practice follows guidelines and meets professional standards.

Possible Action Steps

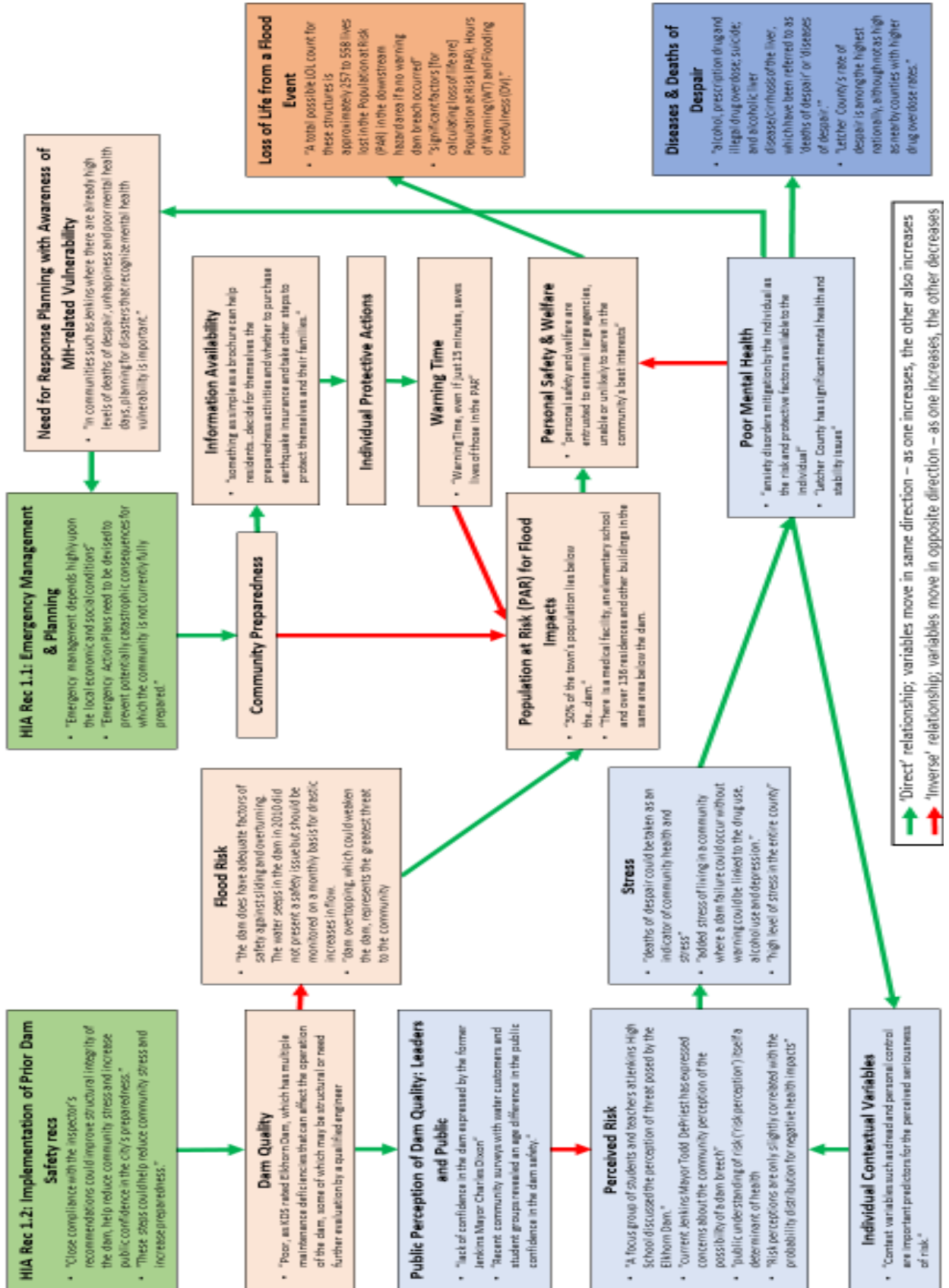
Kentucky State Legislature should:

1. Incorporate HIA mandates into relevant legislation.
2. Fund Area Development Districts and/or local governments to establish HIA infrastructure, enabling them to conduct HIA to aid in policy and program decision making.
3. Designate professional development funds for HIA training and education for planning, health practice and academic professionals at the state, regional and county levels.
4. Colleges and other groups should offer education and training related to health impact assessment.

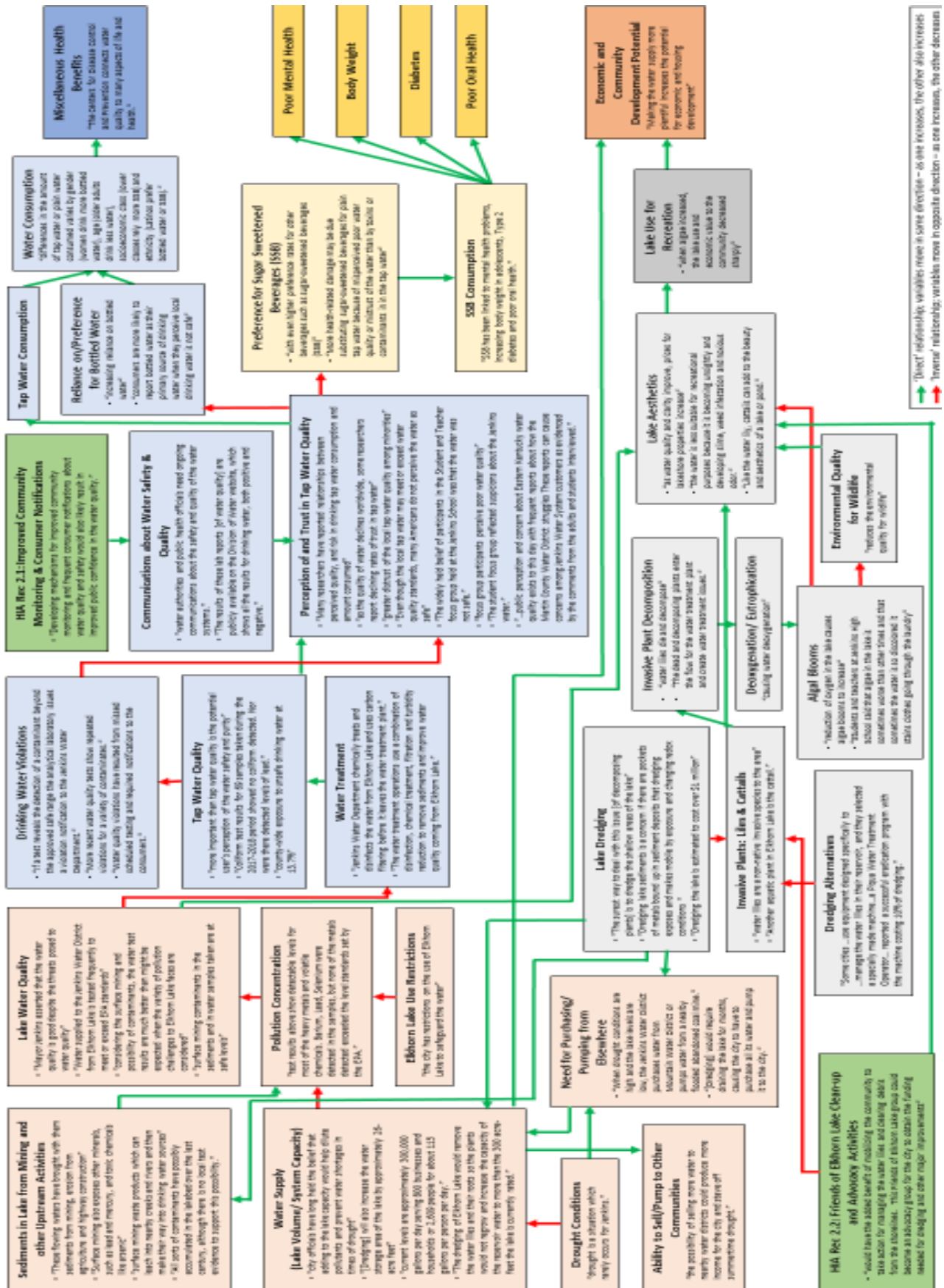
References

1. Committee on Health Impact Assessment; National Research Council. Improving Health in the United States: The Role of Health Impact Assessment. Washington, DC: National Academy of Sciences; 2011.
2. Minimum Elements and Practice Standards for Health Impact Assessment, Version 2. Oakland, CA: North American HIA Practice Standards Working Group; 2010.
3. Gothenburg Consensus Paper: Health Impact Assessment: Main Concepts and Suggested Approach. Copenhagen, Denmark: World Health Organization Regional Office for Europe, European Centre for Health Policy; 1999.

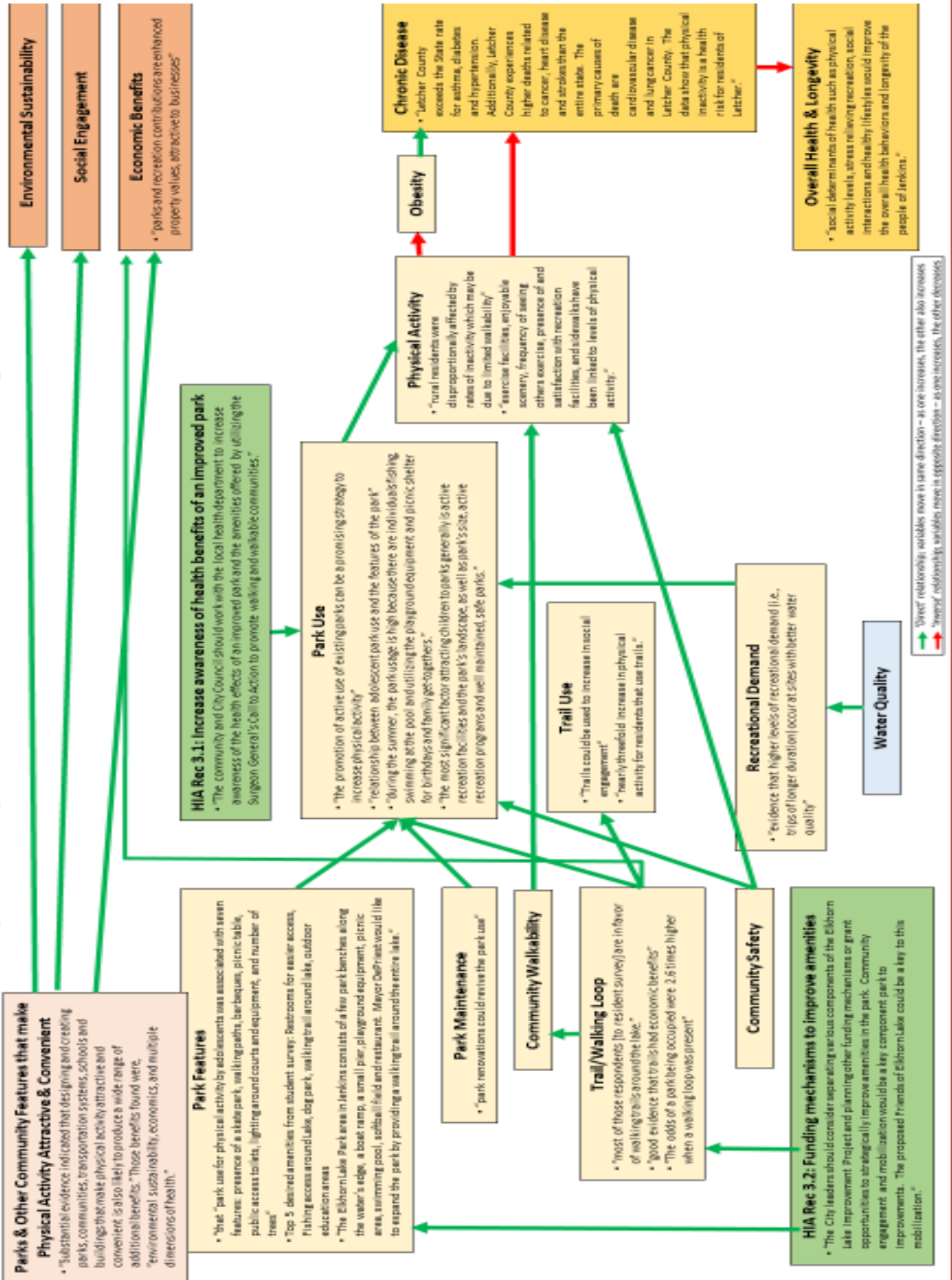
Conceptual Pathway (Detail) for Research Issue 1: Elkhorn Lake Dam Safety and Public Health



Conceptual Pathway (Detail) for Research Issue 2: Water Quality Impact on Health



Conceptual Pathway for Research Issue 3: Park Amenities Influencing Health



*PHOTO SUBMISSION BY STUDENTS FROM JENKINS
INDEPENDENT SCHOOLS*

I love how the lake is family oriented. For example, there is a park amongst the lake for kids and family to have a great time. There are also picnic tables along the sides of the lake so families can enjoy the great view while eating lunch.

PHOTO BY ALYSSA ROSE 12TH GRADE JENKINS HIGH SCHOOL





One thing I dislike about the lake is how it's rarely kept clean. There's always a constant worry about the sediment build up, algae, Lilly pads, and duck droppings. The lake is also not a good fishing spot anymore.

PHOTO BY ALYSSA ROSE 12TH GRADE JENKINS HIGH SCHOOL



PHOTO BY JEREMY POTTER
11TH GRADE JENKINS HIGH

There is one negative to this beautiful area. The overall upkeep situation needs to be improved. The chain links for the swing could possibly become dilapidated, as they are already old and becoming rusty. The grass could be cut, and the fence is rickety. As I don't know if the funds are available, this beautiful area needs to be preserved, so there are a few small improvements to be made.



A fact that concerns me about Elkhorn Lake is its location to the roadway. This picture shows the designated vehicle parking area, which is also directly connected to the road, which is a safety concern.

PHOTO BY SHAUN MICHAEL COLLIER 6TH GRADE
JENKINS MIDDLE SCHOOL

Elkhorn Lake Improvement Project



I appreciate the fact that Elhorn Lake makes use of the talents of local tradesmen. This new dock was built by Letcher County citizens and will be enjoyed for many years to come by others.

However, one thing I do not like about Elkhorn Lake is the fact that the lily pads have become very invasive and often create hassels for people fishing.

PHOTO BY JERRICA THACKER 10TH GRADE JENKINS HIGH SCHOOL

A problem that Elkhorn Lake faces is the fact that many of the swings, such as the one pictured, are not located in a central location.

This particular swing is not easily accessible for all people, such as elderly citizens.

A solution might be to create walkways.



PHOTO BY KRISTEN THACKER 10TH GRADE JENKINS HIGH SCHOOL