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# Berkeley Youth Alternatives Fieldwork Summary Report: Assessing Social Determinants to Improve the Physical Health and Academic Development for Youth in Berkeley, California

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Berkeley Youth Alternatives Fieldwork Summary Report:  
Assessing Social Determinants to Improve the Physical Health and  
Academic Development for Youth in Berkeley, California

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Master of Public Health

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**Abstract**

The following paper summarizes the three hundred hour fieldwork experience at Berkeley Youth Alternatives (BYA), a non-profit community-based organization located in Southwest Berkeley that is committed to combating the social determinants that contribute to the prevalent health disparities within their community. The fieldwork internship is a major requirement in completing the Master's of Public Health (MPH) program at the University of San Francisco (USF), and allows the education and experience gained over the duration of the program to be applied in a real public health setting.

The overall goal of the internship experience was to assess the social determinants of health, and how they affect the well-being of youth in the East Bay. The fieldwork activities centered around grant writing, research, and program planning in order to develop programs on nutrition and physical activity, as well as Science, Technology, Engineering, and Mathematics (STEM) education. Background information, the implementation process, and potential results for each project and topic are discussed. The public health significance of the proposed projects are also included, as well as the application and relevance of USF MPH competencies and coursework relative to the fieldwork internship. The paper concludes with a description of the overall experience.

**Introduction**

Many environmental and social factors influence the health and development of children and adolescents, therefore it is important for different societal sectors to engage in a collaborate effort to address child and adolescent health in a more comprehensive way (Center for Disease Control and Prevention, 2014). Social determinants of health, such as the environment, socioeconomic status, education level, culture, genetics, access to services, and relationships all play huge roles in an individual's overall health and well-being. These social determinants, along with many others, give rise to the health disparities that are present in today's society. For example, the same academic opportunities and access to services that are available to children in most communities are rarely presented to children who reside in low income neighborhoods. So what can be done to help low-income, at-risk youth become healthy, successful members of society like their more affluent counterparts?

Berkeley Youth Alternatives (BYA), a non-profit community-based organization located in Southwest Berkeley, has been providing numerous health and academic programs and services for over four decades that target low income youth of color and their families. BYA was founded in 1969 as a runaway shelter, and is considered as a safe-haven for children and teens until this day. BYA is committed to combating the social determinants that contribute to the prevalent health disparities within their community through proper intervention and prevention methods, with the overall goal of helping individuals reach their full potential.

A three hundred hour fieldwork internship was completed over the course of three months that focused on the topics of nutrition, physical fitness, and STEM (science,

technology, engineering, and mathematics) education. The primary intervention methods observed during the internship experience to address these topics were grant writing, research, and program planning. At this moment, it is difficult to report any results or conclusions on project impact and effectiveness since the grant proposals are currently under review and the programs are still being developed. However, the purpose, program frameworks, and potential outcomes of these projects will be addressed.

## **Background**

There are many factors that contribute to the overall well-being of children and adolescents, with two major ones being their physical health and quality of education. The scope of the work done during this fieldwork internship can be broken down into two distinct major initiatives: 1) nutrition and physical activity, and 2) STEM education.

### *Nutrition and Physical Activity*

The Center for Disease Control and Prevention (CDC) reports that from 1980 to 2012, there was an 11% increase in obesity for children ages 6-11, and a 16% increase for adolescents ages 12-19 (CDC, 2014). From 2011 to 2012, roughly 12.5 million children and adolescents ages 2 to 19 years were obese, with higher obesity prevalence among Hispanics (22.4%) and non-Hispanic black youth (20.2%) in the United States (CDC, 2014).

Furthermore, children from low-income families tend to have higher rates of obesity due to having less access to healthy food choices and limited areas for physical activity (CDC, 2013).

There are many instant and lasting health issues associated with childhood obesity. Some immediate health effects that obese youth are more likely to have include risk factors for cardiovascular disease, such as high cholesterol or high blood pressure, prediabetes, and a greater risk for bone and joint problems, sleep apnea, and social and

psychological problems (CDC, 2014). Because children who are obese have a higher risk of being obese as adults, they may face more serious, long-term adult health problems such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis (CDC, 2014).

The good news is that childhood obesity is preventable. Eating healthy and regular exercise are important for proper growth and development, and are good lifestyle habits that can prevent health problems and lower the risk of becoming obese and developing obesity-related diseases (CDC, 2014). Because there are so many social determinants that can influence a child's dietary and physical habits, development, and perception of health, it is imperative to educate children and adolescents on the benefits of eating healthy and staying active, and how these behaviors can ensure a better future and quality of life.

### *STEM Education*

Education is an important factor in children and adolescent health and development. Individuals with higher levels of education tend to have more positive health outcomes (Cutler & Lleras-Muney, 2007). After school programs provided by non-profit agencies can provide additional academic assistance and opportunities to children who are part of schools in lower-income communities that lack proper resources, and for adolescents who need help in school and/or do not prioritize their education.

According to a 2010 federal report by the President's Council of Advisors on Science and Technology, minority groups such as African Americans, Hispanics, Native Americans, and women are critically underrepresented in the growing fields of science, technology, engineering, and mathematics (STEM). In addition to American students

lacking proficiency in STEM subjects compared to students from other countries, they also lack interest in STEM fields. Even though a gender gap exists only in STEM interest and not aptitude, women and minority students have been gravitating away from STEM professions (President's Council of Advisors on Science and Technology, 2010).

In response to this compelling evidence, President Barack Obama has made STEM education a national priority with the goal of improving STEM achievement across gender and ethnic groups, while elevating American students to the top of the list in science and technology (U.S. Department of Education, n.d.). The national initiative has caused STEM education programs, especially ones that target young girls, to exist all over the nation, state, and in the Bay Area. Increasing STEM learning in children and adolescents helps them progress academically, build self-esteem, and open their lives up to more educational and professional opportunities. STEM education not only serves as a great investment in the future career and professional development of adolescents, but for the overall success and growth of the United States as well.

### **The Agency: Berkeley Youth Alternatives**

Berkeley Youth Alternatives (BYA) is one of the largest non-profit organizations in Southwest Berkeley that has been serving low-income to poverty-level, "at-risk" youth and their families for over forty years. BYA is a well-established, community-based center that serves up to 1,200 youth and family members annually from Berkeley, Alameda County, and other East Bay cities. The agency continually partners with various organizations and nearby schools to achieve their shared goals of improving the overall health of the community, while providing youth with the help they need to gain knowledge and develop relevant skills to ensure a prosperous future. BYA's central

vision is to “provide a secure and nurturing environment for all the children, youth, young adults, and families of the community” where they can thrive and reach their full potential (Berkeley Youth Alternatives, 2010).

BYA’s mission statement, which can be found on their website, is as follows: “Our mission is to help children, youth, and their families address issues and problems via Prevention by reaching youth before their problems become crises, and via Intervention through the provision of support services to youth entangled in the juvenile justice system. BYA helps to build capacity within individuals to reach their innate potential.” The agency holds a holistic perception of health, and is committed to providing pathways for youth and families to make better choices in order to live healthier lives. Their vision and mission is reflected in the types of programs they offer.

BYA has an array of thirty programs and services that meet the growing needs of the community. There is a Reentry and Prevention Services Department as well as Youth and Family Opportunity Hub that have mentorship-focused programs which each serves over 160 individuals. The Sports and Fitness Department serves 400 to 500 children and adolescents from ages 6 to 21 by promoting physical activity, increasing skills and resiliency, and providing healthier activities for youth. BYA’s Spark Health internship program encourages youth, especially youth of color, to pursue careers in health care and public health. In addition, there are mental health services for individuals and families, and yoga and meditation classes to promote mindfulness, which are all provided by the Counseling Center. BYA also has programs for job training and placement, academic assistance, literacy development, as well as garden and landscaping training. All these programs are created to attain three desired outcomes: academic success, economic self-



sufficiency, and overall health and well-being. For a detailed understanding of BYA's framework, see BYA's Continuum of Care Model in Appendix A.

The organization partakes in educational and research efforts to sustain and increase the competency of staff members and relevance of their overall goals and objectives. The agency provides opportunities for staff members to attend community board meetings, conferences, and trainings where new knowledge and skills can be attained. BYA's research efforts are done to assess the needs of their target populations, and to evaluate the significance and effectiveness of current programs in relation to any current evidence-based best practices. The most current and successful evidence-based practices identified are evaluated to see if the organization has the means to implement the intervention, and if the intervention methods are applicable to a certain program's target issue and population. Furthermore, partnering with other organizations and groups provide BYA staff with additional educational and research opportunities. Kevin Williams, JD, MPH, the Associate Director and Director of Development and Policy at BYA typically assumes the role of preceptor to undergraduate and graduate interns who are pursuing public health related degrees, and is in charge of all policy-related things. He and the Executive Director, Niculia "Nikki" Williams, make sure that BYA upholds their ten main objectives and goals that are applicable to all the programs within the agency. BYA typically measures the success and progress of their objectives and programs through monthly program reports and surveying participants.

### **Implementation of the Project and Methods Used**

The scope of work for undergraduate and graduate student interns at BYA who are pursuing health related degrees usually involves extensive research, grant writing,

and/or program planning, with opportunities to network in and outside of BYA. The work done by the intern is used to evaluate and improve current BYA programs and practices, and can also be utilized as the basis to create a new program or public health initiative within the agency. For this particular internship experience, the main objectives were to partake in research, grant writing, and collaborative work to strengthen the current nutrition program, and create a STEM education initiative within BYA. The other fieldwork goals, objectives, and activities can be found in detail in Appendix C.

Attaining a fieldwork internship that would provide opportunities to ultimately impact the lives of children and adolescents was a priority. This internship provided the opportunity to affect the well-being of youth in a more systematic and indirect way. After an interview, orientation, and drafting the fieldwork objectives and competencies, the internship began on May 19, 2014 through August 15, 2014. Two main grant projects associated with program planning were completed during the three month fieldwork internship: 1) one Kaiser Permanente mini-grant pertaining to healthy eating and active living to help revamp the current nutrition program, and 2) an NBC Universal grant to address the development of a STEM-related health career pathway and/or program at BYA. The following sections will explain the theory and framework used as the basis for each program design, as well as the process and timeline of each project.

### *The Behavioral Model*

It is essential to have a behavioral model or theory as a foundation for each project. The Transtheoretical Model (TTM) is the standard behavioral model for most programs at BYA, and was the behavioral model of choice for the two grants and programs that were created. TTM incorporates temporal stages of change where

individuals start off at a certain stage and progress to another in terms of individual behavior modification over time (Pro-change Behavior Systems, Inc., 2014). The stages in order are as follows: precontemplation, contemplation, preparation, action, and maintenance (Appendix B). Most of the youth that BYA targets through their programs are in the precontemplation or contemplation stage, and the goal is to help their health behaviors progress towards the action and maintenance stage. The transtheoretical part of the model name implies that a number of constructs from other theories can be applied to different behaviors, populations, and situations (Pro-change Behavior Systems, Inc., 2014).

### *Nutrition and Physical Fitness*

In regards to nutrition and physical fitness, some youth may not even be thinking of prioritizing their health through proper dieting and regular physical activity. The proposed nutrition and physical activity program intervention was designed to target individuals at the precontemplation stage and ensure that participants get to the action and maintenance stages through empowering health education and promotion activities.

The nutrition and physical activity proposed program is called *Fitness for Fun*, which incorporates health education and promotion activities to increase healthy eating and active living among youth and their families living in East Bay communities. The program aimed to reduce the incidence and prevalence of obesity and diabetes among low-income and poverty-level African American and Latino children from Berkeley, and other neighboring cities. The program required partnerships with the BYA community garden and other local organizations such as the Berkeley YMCA, the City of Berkeley, and LifeLong Medical Care, who all have relevant existing programs and resources BYA

could benefit from due to their similar objectives and goals. The proposed program highlights the use of BYA's community garden and incorporates youth competitions, community health events, the production of media resources, and the use of photovoice to create deliverables that youth can learn from and share with others.

In order to be eligible for the Kaiser mini-grant, a two page letter of inquiry (LOI) had to be drafted and submitted before being given the opportunity to attain the full grant application. It was important to have an innovative program, and working closely with the SPARK Health Program Coordinator, Keisha Burdine, MPH, who also served as a co-preceptor, helped the program planning process progress in a steadier fashion. Keisha is a highly experienced public health practitioner, and has a very creative mind and clear vision of how health programs and outreaches should be structured. Planning the nutrition and fitness program was an on-going process that involved a lot of editing, refining, collaboration, and research. Fortunately, after over a month of waiting, the LOI was accepted, and Kaiser provided BYA with the full grant application. The grant application was completed and submitted in early August.

### *STEM Education*

BYA is taking part in the national initiative to increase STEM learning within the youth programs offered at BYA, with an emphasis in targeting young girls. It is important for BYA to instill a college-thinking mindset in all the individuals that pass through the agencies doors. Therefore, BYA is seeking ways to provide youth with STEM education and introduce them to STEM-related health careers with hopes that they pursue these in the future is a major goal of the agency. The proposed intervention targets individuals who may be in the very early stages of change in hopes that they progress to the action

stage where they pursue a STEM career, and/or maintain an interest in STEM subjects during their academic years and beyond.

To accomplish the goals of this project, a STEM work group was formed, which consisted of a total of five people, three of whom have MPH degrees. The collaborative work was crucial in this process of this project. The work group will continue their work until an official intervention is established in the fall. BYA is currently in the formative stages of incorporating STEM education into their agency; however, the agency looks to expand on what is already being done, and how STEM education can be integrated into existing programs.

A needs assessment and literature review were done to understand the benefits of STEM education, and how students can get interested and stay motivated when learning and doing work in these fields. The findings of this literature review were presented during the second work group meeting in early July, and can be found in Appendix D. Fortunately, an NBC Universal Bay Area grant opportunity came up around late June to early July, which was available to non-profit programs offering 21<sup>st</sup> Century Solutions to current issues in society. BYA's STEM initiative was integrated in the grant by highlighting the community corner clinics that BYA provides to the community, and how these clinics increase community engagement, build capacity within youth, and expose youth to STEM-related health careers. The grant was difficult to complete due to the extreme character limitations within each section, but after much editing, the application was finally submitted in early August.

**Results/Findings**

Outreach efforts to promote the objectives of both the nutrition and physical activity and STEM education interventions will be done to recruit participants inside and outside of BYA. If the expected outcomes occur following the potential success of each program, youth and their families will be more self-aware, knowledgeable about nutrition, conscious about their health behaviors, and more active. Also, youth will increase their knowledge in STEM subjects, and develop an interest in STEM topics and career paths.

The Kaiser Permanente grant and NBC Universal grant are currently under review. Until the funding for these grants are awarded, the nutrition and physical activity program changes cannot be fully implemented, and an entire STEM program may not be developed. However, potential results and expected outcomes for each project and future changes can be discussed.

*Nutrition and Physical Activity*

Firstly, the implementation of *Fitness for Fun* would increase the number of organizational partnerships within the Berkeley community, while also deepening any existing partnerships. Secondly, there would be more connectedness among BYA and within families due to more family-related nutrition events. Thirdly, participating youth would become more self-aware and empowered through the knowledge and skills gained from participating in events and health promotion projects. Lastly, BYA's efforts would have contributed to a decrease in obesity and diabetes rates in Berkeley and surrounding areas. The grant money would also allow BYA to expand the BYA Community Garden in order to grow more fresh produce and host family events for the nutrition program.

Additionally, partnering with local organizations such as the Berkeley YMCA, the City of Berkeley, and LifeLong Medical Care will ensure program longevity and sustainability.

### *STEM Education*

A STEM program is currently in the works by the BYA STEM workgroup. So far, the main objective is to introduce youth to the idea of pursuing a STEM-related health career by exposing them to mentors in STEM fields and getting them involved in health activities and events. Additional time is needed to create a full-on STEM program and/or initiative within BYA. With additional funding, BYA would be able to provide youth with more resources that expand their learning on science, technology, engineering, and math subject areas. In addition, adolescents will be exposed to numerous career options and mentors that could help influence their future career paths.

There were a few central takeaways from the STEM literature review (Appendix D) that was completed that can be applied to potential STEM initiatives at BYA. To spark interest in STEM fields, future interventions should incorporate hands on learning, teamwork and media usage (Evans, Lopez, Maddox, Drape, & Duke, 2014). Lyon, Jafri, & St. Louis (2012) suggests that young girls in STEM programs benefit from having long-term relationships with mentors, and a study by Mosatche, Matloff-Nieves, Kekelis, and Lawner (2013) stresses the importance of role-models who closely resemble participants in terms of upbringing and background because it helps young girls relate to these STEM role-models and envision a career path similar to theirs. Furthermore, Wood, Ellison, Okyoung, and Periathiruvadi (2012) suggest that interventions must occur prior to high school – during elementary school if possible, in order for girls to improve their

academic STEM performance and have a long-term positive perception of STEM topics and careers.

### **Application of Results and Public Health Significance**

Working with populations that face serious health inequities is a public health priority. Low-income communities, especially ones heavily populated with minorities who are at greater risk for certain health diseases, have the greatest needs in terms of access to services, safer living environments, and educational opportunities. It is of utmost importance to improve health disparities in the communities that need it most, by any means possible.

The public health significance of these projects can be viewed as systematic impacts. On a population level, it is important to invest in younger generations, because intervening early can contribute to better health, behavioral, and educational outcomes in youth at an earlier time in their lives. Also, providing health programs to youth and their families can positively affect family dynamics and lead them into making healthier choices together. In addition, implementing prevention services in communities with scarce health resources and limited knowledge about the health disparities prevalent within their population helps combat the health issues that they are at higher risk for such as diabetes, obesity, hypertension, violence, and HIV/AIDS.

In regards to nutrition and physical activity, the efforts given by BYA and its community partners should hopefully decrease obesity and type II diabetes in the population they serve. More time is required to assess the long-term impact of the programs at a community level. The fight against obesity and diabetes is an on-going national effort. As for STEM education, exposing youth, especially young girls, to



projects and careers in science, technology, engineering, and mathematics, helps to increase the STEM workforce, improve academic development, and building self confidence in youth and young girls who choose to pursue a career in these fields. Providing pathways that help adolescents gain skills and knowledge to pursue careers in health related STEM fields is the overall goal of BYA's initiative.

Designing and implementing innovative prevention programs that provide resources, health education and promotion activities for youth and their families is crucial in low-income communities such as Southwest Berkeley. However, programs cannot exist without funding. Therefore, producing quality grants that receive funding is a necessity because without funding, community safe havens like BYA wouldn't exist.

There were many lessons learned in respect to how a non-profit functions, and on a personal level as well. One big lesson is to remember that not all programs are applicable everywhere. It is important to understand the needs of the community one is serving, and to have a community-based participatory research approach when planning any health program or event. Also, the best way to expand the reach of the intervention, establish better relationships, and remain resourceful is by working collaboratively with partnering organizations who have the same goals and are doing similar work within the same target population. A larger public health impact can be achieved through partnering with other agencies.

A better idea of future interventions and projects to combat the public health issues BYA is committed to addressing depend on the plausible results of the proposed programs. With more research on the health topics at hand and thorough program evaluations, further implications on prospective programs can be tailored to the target

population. Community-based research methods should be practiced more frequently when structuring a program. Understanding the interests and needs of the target population is invaluable input that must be considered in every step of the program planning process.

### **Competencies Addressed**

The University of San Francisco's Master of Public Health (USF MPH) program requires each student to prepare a set of learning objectives with their fieldwork preceptor. The prominent objectives of the fieldwork experience were: helping to develop a STEM initiative, making recommendations for strengthening BYA's nutrition program, and completing proposal research and writing for health education funding and nutrition education (Appendix C). Aside from completing the given activities, these objectives were accomplished with the invaluable input and guidance provided by the STEM workgroup and both preceptors.

The USF MPH program also covers a total of twelve competencies, of which most were addressed during the fieldwork internship. All twelve competencies can be found in the USF MPH Fieldwork Manual on page 45. Reviewing "the health status of populations and their related determinants of health and illness," assessing public health literature, applying theoretical constructs of health behavior when planning interventions, demonstrating collaborative skills during evidence based projects, and developing public culturally relevant health programs were the main competencies observed.

The cross-cutting interdisciplinary values that were applied to the internship experience were systems thinking, program planning, and communication and informatics. The process of grant writing requires one to think of how one system (i.e.

quality of education) affects other systems (health, income level, etc.). Grant writing also goes hand in hand with program planning, and program planning can rarely happen without collaborative work. Attending work group meetings and informational interviews helped build communication skills and increase knowledge in public health issues and practices.

Knowledge and skills from the five core knowledge areas – Biostatistics, Epidemiology, Social and Behavioral Sciences, Environmental Health, and Public Health Administration and Leadership – were all applied during the fieldwork experience. Each of those required courses proved to be essential since the main activities centered around research, writing, and program planning, and because the overall scope of the internship focused on assessing social determinants of health. Concepts from Community-Based Participatory Research were also utilized, since BYA is first and foremost a community-based organization that values the needs of their participants.

### **Conclusion**

Having a holistic approach to health and well-being reflects the true mission of public health. As a well-established agency, BYA understands that a child's health should be seen as a comprehensive entity, and that numerous factors that contribute to the overall health of an individual should be addressed. The various programs provided at BYA prove that they are serious about impacting the lives of youth and families of color from low-income communities in the Bay Area.

To much surprise, program planning turned out to be more enjoyable than expected due to the cooperative team of people and amount of creativity required for each project. Working with people that have complementary styles of thinking and creating

relative to your own ways is a rarity that helps project development much easier and more enjoyable. Due to all the extensive research, a deeper interest in STEM education and possible intervention methods has been formed. In addition to attaining new skills and knowledge on different health topics, program planning, grant writing, collaborative work, and the non-profit realm, the most invaluable thing that was gained throughout this experience was the relationships that were formed.

The goal was to work with a youth population, and the outcomes exceeded the expectations. Generations of people have passed through BYA's doors since 1969, and more generations are welcome to do so as long as BYA remains. Though there was no direct contact with the youth as far as intervention methods are concerned, it was easy to see that the children and adolescents who attend and visit BYA definitely have fun learning, growing, and playing at a safe place where they are always welcomed. Many children's lives have changed for the better thanks to the countless efforts of BYA.

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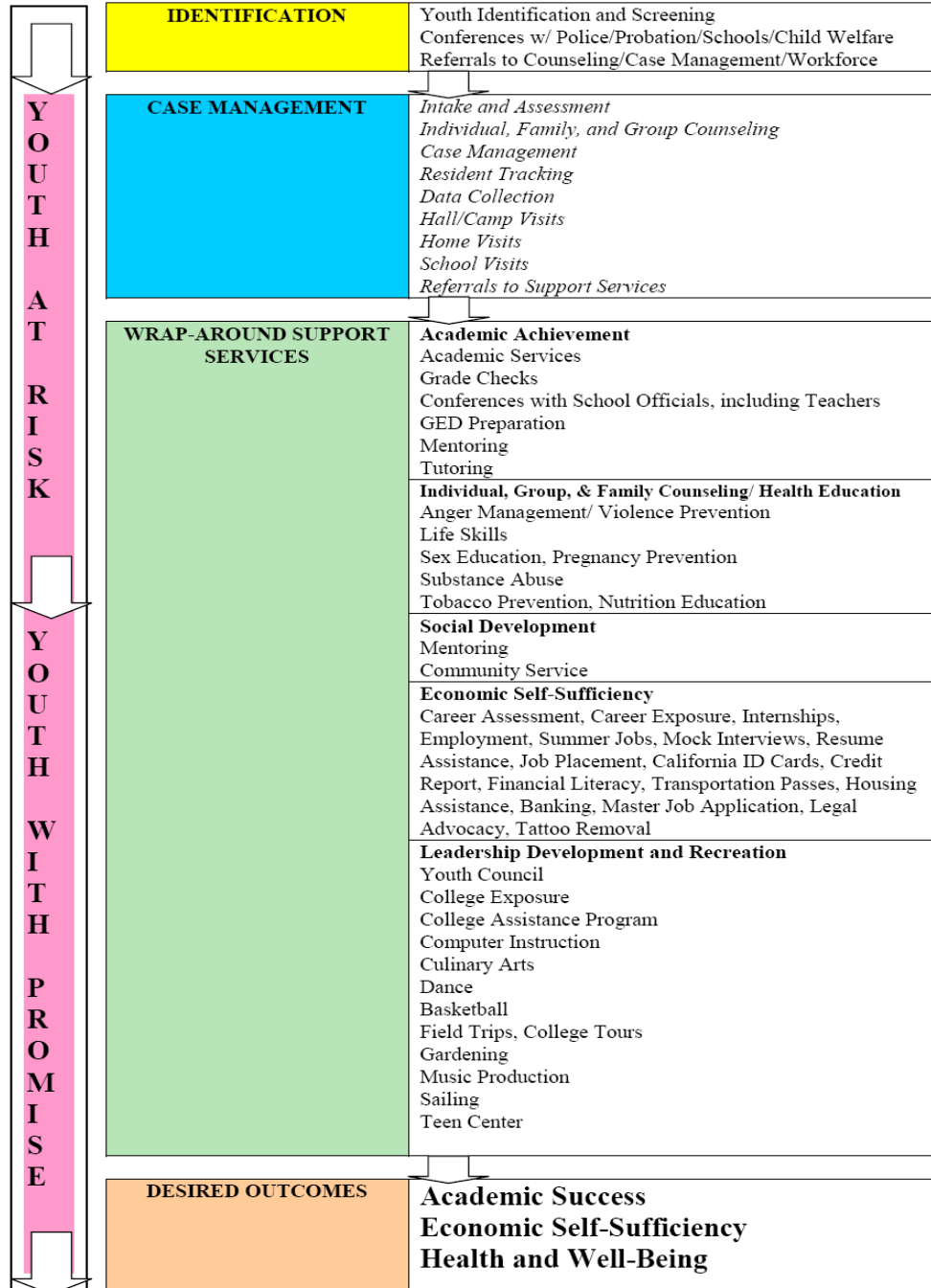
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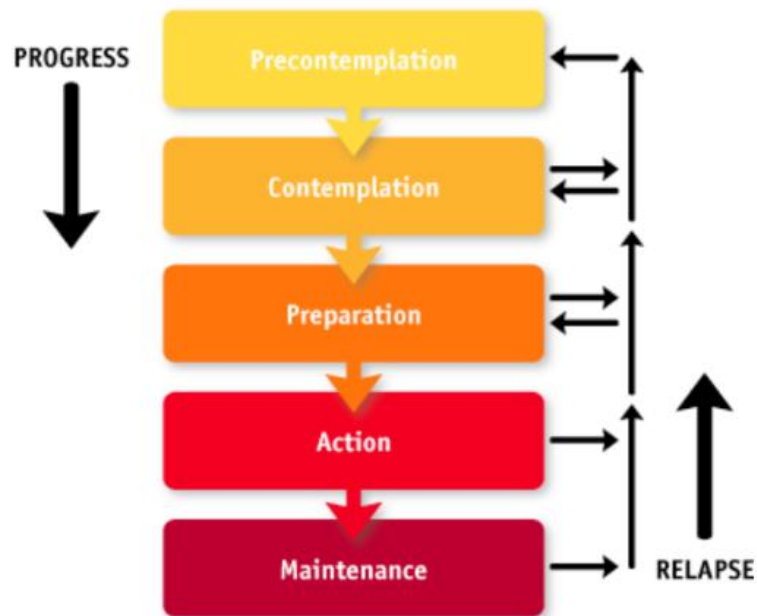
Appendix A  
**BYA Continuum of Care Model**

**BYA- Continuum of Care:  
 Prevention, Intervention, & Youth Development Services (Ages 13-24)**



Appendix B  
**The Transtheoretical Model**

Transtheoretical Model: Stages of Change



Prochaska and DiClemente

**Image Source:** [http://shrdocs.com/pars\\_docs/refs/11/10505/img39.jpg](http://shrdocs.com/pars_docs/refs/11/10505/img39.jpg)



Appendix C  
**Student Learning Contract Attachment 1**

<b>Goal 1.</b> Identify individual, organizational and community concerns, assets, resources and deficits for social and behavioral science interventions				
<b>Objectives</b>	<b>Activities</b>	<b>Start/End Date</b>	<b>Who is Responsible</b>	<b>Tracking Measures</b>
Helping to develop our STEM (Science, Technology, Engineering, and Math) initiative as part of our Pre-Health pipeline program	Report of current STEM activities in Berkeley and surrounding cities	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Biweekly meetings with preceptors
	Report on current Pre-Health activities in Berkeley and surrounding cities	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Biweekly meetings with preceptors
	Recommendations on STEM activities that BYA could incorporate	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Biweekly meetings with preceptors

<b>Goal 2.</b> Identify critical stakeholders for the planning and implementation of public health programs, policies and interventions				
<b>Objectives</b>	<b>Activities</b>	<b>Start/End Date</b>	<b>Who is Responsible</b>	<b>Tracking Measures</b>
Make recommendations for strengthening BYA's nutrition program	Final assessment and report on BYA's nutrition program	5/19/14 - 8/15/14	Alane Cruz	Submit drafts to preceptors
	Compile a potential needs assessment and literature review	5/19/14 - 8/15/14	Alane Cruz	Submit drafts to preceptors

<b>Goal 3.</b> Describe the role of social and community factors in both the onset and solution of public health problems				
<b>Objectives</b>	<b>Activities</b>	<b>Start/End Date</b>	<b>Who is Responsible</b>	<b>Tracking Measures</b>
Address needs through reflective, self-directed learning	Experiment by trying new leadership approaches to	5/19/14 - 8/15/14	Alane Cruz	Discuss during meetings with preceptors and other BYA staff

	assess needs of the community			
Ability to see an accurate view of one's own strengths and development needs and how those strengths can help the community	Apply these strengths where they best fit within the scope of all projects being done to come up with solutions to public health problems	5/19/14 - 8/15/14	Alane Cruz	Discuss during meetings with preceptors and other BYA staff

<b>Goal 4.</b> Apply evidence-based approaches in the development of social and behavioral science interventions				
Objectives	Activities	Start/End Date	Who is Responsible	Tracking Measures
Anticipate future developments and obstacles and translate them into opportunities in the present	Work on understanding situations, issues or problems by breaking it into smaller pieces	5/19/14 - 8/15/14	Alane Cruz	Discuss during meetings with preceptors and other BYA staff
Apply complex concepts and develop creative solutions through strategic thinking	Adapt previous solutions in new ways to solve problems	5/19/14 - 8/15/14	Alane Cruz	Discuss during meetings with preceptors and other BYA staff

<b>Goal 5.</b> Specify multiple targets and levels of intervention for social and behavioral science programs and/or policies				
Objectives	Activities	Start/End Date	Who is Responsible	Tracking Measures
Completed proposal research and writing for health education funding for girls health, tobacco prevention, nutrition education	Scan completed on private and public funding for girls health, tobacco prevention, nutrition education	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Submit drafts to preceptors, discuss during biweekly meetings with preceptors
	Logic models for girls health, tobacco prevention, and	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Submit drafts to preceptors, discuss during biweekly

	nutrition education			meetings with preceptors
	At least 1 letter of inquiry is completed for each subject area	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Submit drafts to preceptors, discuss during biweekly meetings with preceptors
	At least 1 grant proposal is completed of the intern's choice	5/19/14 - 8/15/14	Alane Cruz, Kevin Williams, J.D., MPH	Submit drafts to preceptors, discuss during biweekly meetings with preceptors

Appendix D  
**A Brief Literature Review on Initiatives to Engage Youth in the Fields of Science,  
Technology, Engineering, and Mathematics (STEM)**

A Brief Literature Review on Initiatives to Engage Youth in the Fields of  
Science, Technology, Engineering, and Mathematics (STEM)

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July 9, 2014  
Berkeley Youth Alternatives  
STEM Workgroup

## I. Introduction.

Fewer students in the United States are pursuing careers in the growing fields of science, technology, engineering, and mathematics, which are commonly and collectively known as STEM fields. President Barack Obama has made STEM education a national priority with the goal of elevating American students to the top of the global list in the areas of science and technology (U.S. Department of Education, n.d.). However, how can youth who do not attend schools with STEM programs become engaged and interested in pursuing STEM careers, and at what age should students be first exposed to STEM related programs? The following literature summaries are within the scope of how and when STEM programs can be introduced to youth and integrated into after school programs, with particular emphasis on best practices for adolescent girls.

## II. *Interest-Driven Learning Among Middle School Youth in an Out-of-School STEM Studio*

Evans, Lopez, Maddox, Drape, and Duke (2014) present case studies of two middle-school-aged children, one male (Sam) and one female (Ryan), who took part in a one week out-of-school STEM program in rural southwest Virginia. The program, Studio STEM, was a design-based learning approach for youth that centered on problem-based learning (PBL). Evans et al. wanted to understand what roles the engineering design process, technology, and social network forums (SNFs) played in influencing interest and motivating youth to learn more. Students worked together in groups of three through different work stations to complete the task of constructing a solar-powered car, completing a work book, and collecting completion badges along the way. After reviewing footage of interactions in the STEM studio, field notes, interview responses and the products created by youth, researchers found that problem solving, new media, and peer interaction stimulated interest in deeper STEM learning. Sam and Ryan were motivated most by the overall goal of producing a product (a presentation and a functional car, respectively) rather than completing an assignment or receiving incentives, which illustrates how PBL contributes to the motivation of participants. Evans et al. (2014) highlight the importance of hands on learning, teamwork, and media in motivating youth to learn more about STEM topics, and in possibly sparking interests in STEM related fields.

## III. *Beyond the Pipeline: STEM Pathways for Youth Development*

Lyon, Jafri, and St. Louis (2012) discuss why STEM learning should be designed and perceived as more of a pathway rather than a pipeline, which is how it is often referred to as today. The metaphor of a pathway will transform the purpose of STEM education efforts by having STEM experiences work to cultivate youth development, rather than a pipeline which involves students having experiences that ultimately lead them to the STEM workforce. Through a 10-year retrospective study via interviews and online surveys of the effects of Project Exploration programs, researchers from the Center for

Research, Evaluation, and Assessment (REA) were able to identify factors that influenced participating students' decisions to enter and remain in science and with Project Exploration, a Chicago-based nonprofit education organization that makes science accessible to students of color and girls through long-term relationships (Lyon et al., 2012, p. 49). Researchers found that Project Exploration participants were significantly more likely to graduate high school, go to college, and major in science than their counterparts, and they attributed their long-term academic STEM success to the program, especially due to their work with scientists and long-term relationships with caring adults (Lyon et al., 2012, p. 50). Youth STEM programs need to be more non-linear in construction, so as to provide regular and readily available opportunities for youth with the goal of improving youth development rather than increasing the STEM workforce – hopefully the latter is a byproduct of the overall goal. Also, students may be encouraged to pursue careers that involve ongoing contribution towards STEM initiatives and programs such as public policy and journalism, as opposed to a traditional STEM career.

#### IV. *Laptop Use, Interactive Science Software, and Science Learning Among At-Risk Students*

Zheng, Warschauer, Hwang, and Collins (2014) conducted a year long study based on prior research on the impact of laptop computers and science computer programs on 5<sup>th</sup> grade students' science learning in a linguistically diverse California school district, particularly in at-risk students (English learners, Hispanics, and free/reduced lunch recipients). Researchers wanted to investigate the impact of the science program on academic achievement, especially in English Language Learners (ELL), how teachers utilized these resources to facilitate science learning, and how using laptops to drive science learning influenced students' readiness in future STEM endeavors. After group and individual interviews with students and teachers, along with classroom observations were analyzed, Zheng et al. (2014) found that the use of science learning through these laptop computers helped increase ELLs understanding in science, helped create a positive peer learning environment, and had a positive effect on participants' interests and motivation in pursuing STEM careers overall. Also, standardized test scores showed that scientific achievement gaps between at-risk students and their counterparts began to decrease. The study also suggests that at-risk students benefit from technology facilitated learning, however implementation of teaching through technology must be executed with facilitators who are proficient in the program software and computers that are being used by the students.

#### V. *How Middle Schoolers Draw Engineers and Scientists*

Fralick, Kearn, Thompson & Lyons (2009) studied how middle schoolers perceived scientists and engineers to explore how their conception and/or misconceptions of these professions systematically compare to one another. Drawings of either a scientist or engineer, along with explanations of what the figure was working on in the drawing, were completed by approximately 1600

middle school students in southeastern regions of the United States. Results showed that Draw a Scientist (DAS) drawings consisted mostly of males in lab coats doing experiments, whereas Draw an Engineer (DAE) drawings consisted of someone doing construction work. Also, a great amount of DAE drawings had no figure drawn on it, and had half as many objects as DAS drawings (Fralick et al., 2009, p. 67). These findings indicate that youth have huge misconceptions of engineers, and may also lack any knowledge of engineers in general. This study suggests that future engineering outreach efforts should be developed and should perhaps target children prior to high school to influence positive and more accurate perceptions of a career in engineering.

VI. *Effective STEM Programs for Adolescent Girls: Three Approaches and Many Lessons Learned*

Mosatche, Matloff-Nieves, Kekelis, and Lawner (2013) compared and contrasted three successful STEM programs for adolescent girls: Techbridge, Girls Go Techbridge, and Access for Young Women. Techbridge is an afterschool program that originated in Oakland, California for girls in grades 5-12 that allow participants to take part in hands-on projects, as well as STEM academic and career guidance and exploration. Girls Go Techbridge is an extension of the Techbridge program in 13 states that provides Girl Scout council volunteer instructors with a tool-kit of readily available STEM activities and projects for middle school aged girls. Access for Young Women (AFYW) is a STEM infused afterschool leadership program for girls in Queens, New York that was able to recruit girls who weren't necessarily interested in STEM because of their leadership and community-based components. Pre- and post-surveys were done by participants and stakeholders from all three programs. Results showed that girls were more likely to report their confidence in technology-use and interest in pursuing STEM careers the longer they participated in Techbridge and AFYW programs (Mosatche et al., 2013, p. 23). This study also suggests a few things to consider for future effective STEM programs: (1) instructors should maintain a "fun factor," (2) facilitators should be experts of or excited about the subject they are teaching, (3) group work is favored over independent work, and (4) hands-on, real-life applicable activities were the most successful activities. Another big takeaway from this study was that participants should be exposed to role-models who closely resemble them in terms of upbringing and background because it helps young girls have an easier time envisioning a career path similar to these STEM role-models.

VII. *Bringing Up Girls in Science (BUGS): The Effectiveness of an Afterschool Environmental Science Program for Increasing Female Students' Interest in Science Careers*

Wood, Ellison, Okyoung, and Periathiruvadi (2012) did a study on the effects of a program in Texas called Bringing Up Girls In Science (BUGS), a three year project funded by the National Science Foundation. BUGS was an

afterschool program for 4th and 5th grade girls that aimed to increase academic achievement in science by providing learning experiences in environmental science and female mentoring opportunities. Researchers reviewed data from year one of the program, which contains participants who were now entering college. The overall study aimed to answer two main questions: (1) Will educational experience during the 4<sup>th</sup> and 5<sup>th</sup> grade actually increase academic achievement in basic science knowledge, and (2) will early interventions in science learning have a long-term positive effect on girls' perceptions of STEM topics and careers (Wood et al., 2012, p. 49)? In regards to the first question, the Iowa Test of Basic Skills in Science (ITBS-S) results showed that BUGS participants gained significantly greater amounts of science knowledge than non-participants. For the second research question, former BUGS participants completed two assessments to test their perceptions on STEM careers. Compared to groups of females who were former BUGS contrasts, science and non science college majors, and STEM professionals, BUGS participants' perceptions of STEM topics and careers were only significantly higher than BUGS contrasts. Overall, this study suggests that in order for girls to improve their academic STEM performance and have a long-term positive perception of STEM topics and careers, interventions must occur prior to high school – during elementary school if possible – in order to be effective.

#### VIII. Conclusion.

The limited amount of literature presented in this brief review provides sufficient evidence to highlight the importance of perception, purpose, motivation, and mentorship when developing a STEM after school program for youth. In order to influence positive long-term perceptions and attitudes of STEM careers and subjects, youth should be targeted prior to high school, and can be targeted as early as the elementary school years. It is also vital to construct STEM programs with the purpose of improving youth development, rather than solely focusing on ultimately increasing the STEM workforce. STEM programs should involve as much hands on and interactive activities as possible in order to appeal to youth, and should also integrate long-term student-mentor relationships if possible. It is important to provide young girls, and boys as well, with a relatable mentor or role-model to help build their confidence and inspire them in future STEM related work. Effective STEM programs will do one or few of the following: incorporate a long-term mentorship component, help motivate youth to explore STEM related topics, increase academic STEM knowledge, provide youths with positive perceptions of STEM topics and careers early on, and/or improve overall youth development.



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