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*Keywords:* *agriculture based programs, at-risk youth, toxic stress, mitigating toxic stress.*

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# Mitigating Toxic Stress in At-Risk Youth through an Agriculture-based after School Program

Jeanne A. Holcomb [α], Felix Fernando [σ], Diana Cuy Castellanos [ρ] & Kellie Schneider [ω]

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## I. Introduction

Adverse childhood experiences representative of their social and environmental conditions can cause toxic stress, which can lead to lifelong implications for behavior, learning, and overall functioning (Franke, 2014; Francis et al. 2018). Toxic stress is the prolonged activation of the body's stress management system and results from stressful events that are "chronic, uncontrollable, and/or experienced without the child having access to support from caring adults" (Williams Shanks & Robinson, 2012). Social determinants of health (SDH) could be used to describe the contributory factors and how a child's social and environmental conditions could yield toxic stress. SDH are defined as "the conditions in which people are born, grow, live, work and age" (Braveman & Gottlieb, 2014). For youth, SDH are associated with an individual's relationship and interactions within the family, school, peer, and neighborhood environments (Currie et al., 2012; Morgan, 2010). At-risk youth who have experienced toxic stress often have a negative experience within one or several of the mentioned environments (Tome et al., 2012). The need to address toxic stress has led to an increased exploration of possible interventions that minimize the negative outcomes associated with adverse childhood experiences (Franke, 2014).

Rodríguez-Planas (2014) contends that there's a strong need to understand how mentoring programs influence at-risk youth and/or provide opportunities to achieve better life outcomes. Programs that provide positive resources and learning environments could enhance positive moods, help youth stay healthy, and improve their wellbeing (Dickey et al., 2020), thereby counterbalancing implications of toxic stress. Community-based after-school programs could provide mentorship and safe environments where youth can express themselves (Rodríguez-Planas, 2014). Multiple studies have examined the impacts of youth involvement in community gardens or school-based gardening programs (Allen et al., 2008; Ohly, et al., 2016; Ozer, 2006). However, case studies on agricultural-based after school programs focusing on at-risk youth are sparse (Dickey et al., 2020). Therefore, this study addresses an important gap in literature by exploring the experiences of youth with On The Rise (OTR), an agricultural-based after school program for at-risk youth. Specifically, using a phenomenology based approach where semi-structured interviews were supplemented with a SDH questionnaire, several questions were explored. First, what are the social and environmental conditions that could contribute to toxic stress in at-risk youth attending OTR. Second, what are the responses to toxic stress in the day to day lives of the at-risk youth? Third, how does the OTR program helps mitigate and address implications of toxic stress.

As establishing causality between program attributes and participant outcomes require a long-term study, the aim of this study is limited to understanding and describing the perspectives of the at-risk youth. The findings discussed in this study are part of a broader research project aimed at discovering and understanding different experiential dynamics of toxic stress, perceived program impacts, and dietary behavior of the at-risk youth participating in the OTR program. Findings of the research project pertaining to dietary health are reported in authors other published work.

### *a) Toxic Stress Responses (signs) in Youth and Programs to Address Toxic Stress*

An extensive body of literature examines various dynamics related to toxic stress and at-risk youth. The

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aim of this section is to synthesize literature on toxic stress responses and programmatic characteristics that address toxic stress, especially focusing on after-school programs. Areas of the brain that are most likely to be impacted by toxic stress include those related to learning, judgment, emotions, and impulsivity. Research that examine toxic stress responses in youth report a broad range of undesirable outcomes such as: higher levels of depression (or poor stress management skills) and reduced trust (Williams Shanks & Robinson, 2012); increased engagement in criminal activities and substance abuse, including underage drinking (Dynarski et al., 2004; Jensen et al., 2018; Mahatmya & Lohman, 2011); comparatively lower educational achievements (Weisman et al., 2003; Welsh et al., 2002); risky sexual activity ( Tome et al., 2012); unhealthy lifestyles (including poor dietary habits) and higher rates of mental and physical illnesses (Franke, 2014). These responses in the long-term can lead to alcoholism, obesity, increase in suicide attempts, and other serious health implications (Franke, 2014).

Not all children who experience adverse events develop the negative outcomes associated with toxic stress, and protective factors can counterbalance adverse experiences and foster the development of resilience (Williams Shanks & Robinson, 2012). Resilience can be defined as the "skills, attributes, and abilities that enable individuals to adapt to hardships, difficulties, and challenges" (Alvord & Grados, 2005). Youth who build resiliency are more likely to overcome adversity, manage stress, and nurture an optimistic mindset (Hurley, 2018). Supportive adult-child relationships are an important aspect of negating impacts of toxic stress, as at least one stable and committed relationship with an adult is paramount for children (Hamre & Pianta, 2001). Other mechanisms for mitigating toxic stress include building a sense of self-efficacy and perceived control; providing opportunities to strengthen adaptive skills and self-regulatory capacities; and mobilizing sources of faith, hope, and cultural traditions (Franke, 2014).

After school and community-based programs have become increasingly common as an avenue to address or counterbalance implications of toxic stress. The number and types of after-school and community programs has increased substantially over the past two decades. The various programs are diverse and offer a range of activities that are accompanied with adult supervision (Kremer et al., 2015). The purpose of these programs is to influence social, academic and behavioral outcomes. Programs specifically targeting at-risk youth have the potential to provide social environments that encourage a more positive perception of lived environments. The positive perception of lived environments could theoretically foster healthier behaviors and influence future outcomes. For instance, Daud and Carruthers' (2008) exploration of an after-school program for students that reside in high-risk environments revealed four critical attributes of the program: a nurturing and enjoyable environment; learning positive values and behavior; trying new activities and learning new things; and developing a positive plan for the future.

After school and community-based programs often include mentor-mentee relationships and instructional components. The meaningful mentor-mentee relationships that are built through programs are especially important for at-risk children because they have the potential to mitigate the effects of toxic stress (McDaniel et al., 2015; Silke et al., 2019). Grineski's (2003) examination of mentor-mentee dynamics of an after-school program for youth recruited from low-income neighborhoods found that 95% of the child participants felt better about themselves because of their mentor. Other studies such as those by Kuperminc (2018) highlight the importance of mentor-mentee relationships in addressing toxic stress and achieving positive outcomes.

There has been a recent surge in agriculture and garden-based programs for youth within school and community settings. Gardening programs are intended to educate children on gardening and wildlife, which opens new areas of awareness, exploration and learning (Sparks Milling Digital, n.d.). Evaluation of these programs largely focuses on dietary and health-related outcomes, although some have examined the effects on academic performance and using gardening to address stress. Ruiz-Gallardo and Reyes (2013) found that a two-year garden-based learning program focusing on disruptive and low-performing students improved academic outcomes and reduced the dropout rates by 30%. Furthermore, research on gardening and outdoor-based programs report positive effects on academic performance, social interactions, behaviors, and dietary attitudes in youth (Ozer, 2006; Berezowitz et al., 2015). Synthesizing the literature, several points pertinent to this study can be summarized:

A. Children experience toxic stress due to issues such as extreme poverty; abuse and parental neglect; neighborhood violence; dysfunctional family/ household interaction patterns; and food scarcity (Williams Shanks & Robinson, 2012; Franke, 2014).
B. Toxic stress responses (signs) in at-risk youth manifest through a range of behavioral (such as substance abuse, risky sexual activity, and criminal activity), emotional (such as outbursts of anger, higher stress, and anxiety), achievement related (such as lower educational outcomes), and poor health related (such as poor dietary habits) outcomes.
C. After school and community-based programs with certain attributes and characteristics could address or mitigate implications of toxic stress.

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## II. Background: On the Rise (OTR) Program

OTR is an agricultural-based, after school program in central Ohio for at-risk youth struggling with family, social, educational, and behavioral issues. The program serves approximately 20 youth during each calendar year. It has existed for fifteen years, and youth are referred to the program by Children's Services, Juvenile Court, county and city schools, and mental health agencies. The program seeks to promote academic success, build self-esteem, improve social skills, and provide opportunities where youth can experience success through mentorship, tutoring and agriculture-based learning in a supportive, home-like environment. Program participants are transported to OTR after school where they are greeted by the program directors. After having a healthy snack and talking about their day, the youth complete their homework and chores. Mentorship and tutoring are provided by the co-directors as well as local university students and faculty. Once all their homework is finished, the youth complete their daily chores which include cooking, cleaning, caring for animals, sewing, and gardening. Upon completion of the daily chores, everyone sits together at the table and enjoys the dinner they prepared. The youth maintain a garden through the summer and work with goats and chickens year-round. The youth use the farm goods to prepare their meals and sell surplus items at a local farmer's market to support the farm and gain entrepreneurial training.

### a) Participants

A total of 18 youth ages 11-15 from the On The Rise program participated; 9 girls and 9 boys. Of the participants, 33% were Non-Hispanic Black and 66% Non-Hispanic White. The average age was 12.6 (SD: 1.35) years old. Average length of time in the program was 16.07 (SD: 9.24) months. Participating youth were referred to the OTR program through juvenile court, social services or the local school system.

## III. Methodology

This study is part of a broader phenomenology based research project aimed at discovering and understanding different experiential dynamics of toxic stress, perceived program impacts, and dietary behavior of the at-risk youth participating in the OTR program. The research project methodology consisted of qualitative and quantitative methods and tools such as the Youth Behavioral Risk Survey Food Screener, a SDH based questionnaire, and semi-structured interviews.

Mayoh and Onwuegbuzie (2015) argue that phenomenological research methods work extremely well as qualitatively dominant mixed methods research. The justification for combining quantitative and qualitative methods should allow for a single research goal: the identification of the common features of an experience (Mayoh and Onwuegbuzie, 2015). Mayoh and Onwuegbuzie (2015) prescribe the use of preliminary quantitative findings to inform the phenomenological focus in the qualitative phase of the research. The descriptive quantitative data from the SDH questionnaire provided orientation and elucidated that participants endured pertinent environmental conditions and experienced certain toxic stress responses highlighted in literature, which facilitated information rich experiential accounts as recommended by Mayoh and Onwuegbuzie (2015).

The research project design consisted of several stages. The research team made several visits to OTR for initial engagement and to understand the research context. Full Institutional Review Board approval was obtained for the project and the parents/ guardians of the youth were contacted to obtain consent for study participation. Participant consent was also obtained at the time of data collection. The research team made several visits to OTR to complete the surveys and semi-structured interviews with participants. To help facilitate conversation about food environments, the youth were also provided cameras and asked to document their food environment. The pictures were then organized and used in the semi-structured interviews to facilitate dialogue that illuminated and explicated youth experiences related to food. The Food Screener and Photovoice findings are reported in authors other published work.

### a) SDH Questionnaire Development

Perceptions of the social environment and health were measured using items adapted from previous survey instruments (Reininger et al, 2005; Hernandez and Blazer, 2006) to provide further context to each of the identified social environments (home, school, peers and neighborhood) and perceived health. Eight items were utilized and each item was evaluated on a five point Likert-type scale. The items related to participants' perspectives of their interactions within their social environments relating to family, peers, school and neighborhood: "How easy is it for you to talk to your father about things that really bother you?" and "Most of the students in my classes are kind and helpful." Participants were also asked to rate their health from poor to excellent and if they had experienced certain physical and mental conditions, such as headaches, feeling low, and difficulties going to sleep, over the last six months. Frequencies were analyzed to provide context to participants' descriptive perceptions of their social environment and health.

### b) Qualitative Methods

Phenomenology is a research approach used to develop an understanding of the lived experiences of participants (Ashworth, 2003). Previous research examining (Morgan, 2010) social environments (family,



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peer, neighborhood and school) depicting lives of youth were used to draft the interview questions and feedback was obtained from the OTR co-directors. After the participants completed the SDH questionnaire, the research team visited OTR to conduct one-on-one semi-structured interviews with participants. The semi-structured interview guide included questions aimed at understanding different social and environmental conditions of the participants, toxic stress responses of the participants, and the impact of participation in the OTR program. Follow-up probing questions were used as needed to encourage the participants to further describe their experiences. The interviews were audio-recorded and transcribed verbatim.

During data analysis, four researchers trained in qualitative analysis employed the technique of bracketing to identify their own bias and expectations. Next, all four researchers coded three interviews. The codes from the interviews were organized using a spreadsheet and researchers engaged in reflective dialogues to address any discrepancies in coding. After the codes were agreed upon by all the researchers for the three interviews, common themes were identified. The themes were then defined, thereby developing the codebook. The remaining transcripts were divided among the researchers, and the codebook was used to analyze the data and themes from the remaining transcripts. During this process, continuous discussion and expansion of the codebook occurred. Data saturation was reached before all transcripts were coded, indicated by a ceasing of codebook expansion.

Through the use of pictures taken by participants and the feedback from the OTR co-directors on the interview guide, the research team ensured that the participants engaged in a self-inquiry of their experiences and that the participants remained focused on depictions of their experience. The overall research project culminated in a creative synthesis where the research team collaborated with the OTR co-directors to verify and validate the findings. The research team believes that the numerous research tools and methods used to discover pertinent experiences of at-risk youth enables a rich understanding of the dynamics of toxic stress experienced by the participants. The research stages used in the project are consistent with the research design stages prescribed by Moustakas (1994) to conduct a phenomenology based heuristic research study/inquiry. The data that support the findings of this study are available from the corresponding author upon reasonable request.

## IV. Findings

Moustakas (1994) prescribes that phenomenological studies should present a systematic reflection of the essential properties and structures of the examined experience. Accordingly, the findings first describe social and environmental conditions experienced by the youth that could cause toxic stress. Second, the toxic stress responses of the youth are discussed. Third, the findings pertaining to perceptions of the impacts of the OTR program are presented and discussed. Fourth, the characteristics and attributes of the OTR program considered important by the youth are presented and discussed.

### a) *Social and Environmental Conditions Faced by the At-Risk Youth (Family, School, Neighborhood and Peer Environmental Conditions)*

It is not the aim of this study to establish causality between social and environmental conditions and toxic stress; rather the overarching goal of this study it to identify strategies that elp at-risk youth mitigate the impacts of toxic stress. Summaries of the SDH results related to the social environment and the data gathered through semi-structured interviews revealed several social support and environmental conditions experienced by the youth that could potentially contribute to toxic stress such as dysfunctional family relationships, bullying at school, and unsafe and violent neighborhood environments. Table 1 summarizes the SDH questionnaire responses related to participant perceptions of social support and environment. Note that for the survey question asking how easy it was for participants to talk to their mother or father the total number of responses is less than 15. This is because some participants responded 'not applicable' as one or more of their parents was not accessible to them.

*Table 1:* Perceptions of participant social support and environment

| Parents | Easy | Neutral | Not Easy | Total |
|---|---|---|---|---|
| "How easy is it for you to talk to your mother about things that really bother you" | 2 | 5 | 5 | 12 |
| "How easy is it for you to talk to your father about things that really bother you" | 5 | 0 | 7 | 12 |



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| School | Like it/ | Neutral | Do not like it/not good | Total |
|---|---|---|---|---|
| "How do you currently feel about school?" | 5 | 8 | 2 | 15 |
| "How does your school performance compare to your classmates? | 7 | 6 | 2 | 15 |
| | Agree | Neutral | Disagree | Total |
| Most of the students in my classes are kind and helpful. | 2 | 5 | 8 | 15 |
| Neighborhood | | | | |
| "I feel I can trust my neighbors" | 9 | 3 | 3 | 15 |
| "I feel safe in my neighborhood." | 7 | 4 | 4 | 15 |

*b) Family and Neighborhood Environment*

Less than half of participants indicated it was easy to talk to their parents (29%). Family context varied significantly, with a few youth reporting warm and supportive parental relationships. For example, one participant described who they could talk to and trust in the family as "Definitely my brother Frankie. He's my older brother. He is really understanding. He has a different perspective about things which is why I talk to him about my problems. My dad – both my dads, my biological father and my step dad. My step dad really understands and bio dad, he really understands. I talk to my mom about certain things, but I think she tries to be too much of a friend instead of a parent."

Youth recognized several ways their parents and immediate family had a positive influence on their lives. For example, one participant described the influence of their mom on their health as "Probably my mom. Because she was overweight and then she started losing weight. And I felt like she was trying to be healthy for me, like trying to like keep me on the right path instead of eating junk food constantly. And that's basically the thing that made me realize and open my eyes that I need start eating more healthy because I'm going to end up being like my mom, having problems with my heart and all these health conditions." For some youth, grandparents seemed to provide an important source of consistency and care. One participant described why they trust their grandparents through the following excerpt: "My grandma because she has been there since I was born and she got custody of my younger brother and me."

Most, though, described a rotating cast of family members in which some members would come and go. One participant described the people living at home as "My brother, uncle, grandma, grandpa, other people come over like my brother Drew but he isn't from my mother. And my neighbor who is like my brother." Siblings sometimes lived in different houses, and mom's boyfriends, stepdads, and aunts or uncles were frequently mentioned as present, although not necessarily in a positive way. Mental health concerns, drug use, and violence were mentioned. For example, one youth commented that "I can't really trust her [mom] because she has stole from me… My mom got with this idiot and we were all supposed to go somewhere, my mom, this idiot and both of my brothers and me and my younger brothers were just toddlers and this idiot was like on pills or something and we got into a car crash but we are all lucky we survived."

Youth also outlined several other hardships in the home environment that could cause stress such as financial hardships and concomitant impacts such as food hardships. One participant noted that "Because we don't have enough money to go get lunch. Once I was in 3rd grade and for breakfast I felt so bad that I got to eat lunch and breakfast and my mom didn't and my dad didn't." Another youth noted that "My grandma buys our food but right now they cut my grandma's food stamps and we are having to borrow off my aunt and uncle."

About half of the participants perceived their neighborhood as safe (46%) and most felt their neighbors were trustworthy (60%). Neighborhood context also varied greatly, with some youth reporting feeling safe in their neighborhood, with neighbors that they talked with and had positive relationships with. For example, one youth commented that "I feel very comfortable. I can always walk and feel comfortable. The neighbors are so nice. The one neighbor always thinks we have an animal lose, and he's like "I found your cat" or "I found your dog" because we have 6 dogs and 2 cats." Similarly, another youth described their neighborhood as "I live in a trailer park so it is pretty safe and there is a lot of good people there and I have a few friends there." Some youth also expressed positive perceptions of certain neighborhood characteristics such as community gardens in their neighborhood. Comparatively, others talked about hearing gunshots frequently and knowing that drug deals regularly occurred outside their homes. For example, one youth commented that "I don't like it because it is a bunch of



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drug dealers and stuff…It is usually someone I know. Like it was my aunt's boyfriend's son."

*c) School Environment and Peer Relationship Conditions*

Most of the participants either responded they liked school or were neutral regarding it (87%) and felt their performance was equal or better than their peers (87%). When asked about who in their life they could talk with, many of the youth reported the school counselors or specific teachers at school. For example, one participant commented "My teachers are nice...but all together, I can trust my teachers." However, participants overall did not perceive students in their class at school as being kind (87%).

Several youth reported instances of bullying at school and the impact these experiences had on them. One youth commented that "Attendance is ugh. Last year I missed like 50+ days because I was being bullied and I didn't tell anybody. I just didn't go to school. This year there has been some bullying but they have a website to report a bully and I did and I haven't had to deal with him as much this year." Another youth highlighted that "I've dealt with being nitpicked at since I started school. Third grade was really when it hit me hard. Like I was getting picked on every single day. About how I eat. About how I look. About how I dressed. They were just rude, but they didn't know what I had been through, they don't know the person that I am, they don't know that I'm a caring person, they don't know that I'll help them in any way." Similarly, another youth described "I don't want to get sick. I love school too much to miss school. Because like last year, it was terrible, I was getting in trouble constantly. But this year, like I feel welcome there. I haven't been bullied [different school]." Bullying seemed to be a major theme highlighted by the youth that could contribute to toxic stress. As outlined by the quotes above, peer relationships were complex; some youth reported experiencing bullying, but most could name at least one peer whom they considered a friend they could talk with.

*d) Toxic Stress Responses (signs) of the Youth*

Table 2 summarizes the SDH questionnaire responses of youth on perceptions of their overall health, physical, and mental conditions. Two participants did not respond to the survey questions related to irritability/bad temper. Most youth felt their health was fair (53%) with symptoms experienced including lack of sleep (60%), headaches (40%), feeling nervous (33%), and feeling low (33%).

*Table 2:* Perceptions of health, physical, and mental conditions

| Health | Excellent/Good | Fair | Poor | Total |
|---|---|---|---|---|
| Perception of health | 7 | 8 | 0 | 15 |
| How often do you experience… | Often | Sometimes | Rarely or Never | |
| Headaches | 6 | 3 | 6 | 15 |
| Stomach aches | 2 | 8 | 5 | 15 |
| Feeling low | 5 | 6 | 4 | 15 |
| Irritability/bad temper | 4 | 7 | 2 | 13 |
| Feeling nervous | 5 | 4 | 6 | 15 |
| Difficulty sleeping | 9 | 3 | 3 | 15 |

Several youth described experiencing irritability, feeling upset, and anger in the context of how OTR has had a positive impact on those feelings and respective social environments. For example, one youth noted "It probably impacted it a lot because I have anger issues. When I was in 2nd-6th [grade] I had a habit of punching holes in walls…And I don't feel the need to smack someone on the head a lot." Another youth commented "I'm not being rude. I'm not slamming doors. I'm not being sent to the office." Another youth highlighted the changes by describing that "Like I haven't talked back. I haven't raised my voice. I haven't gotten overly angry. Like, I've been mad or whatever, but I've like, controlled it. And it's been really nice and my probation checkups, like my probation office is really proud of me."

Several youth described poor dietary habits and resulting health complications in comparison to the experiences of OTR. One youth noted that "Ms. Deb wants to keep us healthy. Instead of like, getting overweight, not eating healthy, and something



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happening, it's all from not eating healthy." However, youth also described current or ongoing events, while acknowledging they are making progress. For example, one participant described how they are still involved with the court system: "Because in the past, I've cut my wrists, I've cut myself, but ever since like I went to counseling, it's helped. I haven't cut myself. It's helped me on through life, it's helped me get on the right path. But I'm still not on the right path all the way. I'm half on, half off. Because I'm still on probation. I'm still involved with law enforcement because of my mom and dad arguing. I'm still involved with the juvenile court. Like I'm still involved with the court system period." Another youth similarly described that "I'm more letting myself out there and trying to make new friends and not being me and just wanting to be by myself and be in my bubble. Because when I was little I didn't have many friends and I got bullied a lot and I just let it all off of me. I did nothing about it and all I did was let it block me. I did nothing. I just let my life fade away. When it was recess I just was by myself. I wanted no one in my life except my family. I still am bullied. I was shy to tell at parent teacher conferences to tell my teachers how my class mates were picking on me and how I feel." These comments demonstrate that while some youth continue to experience certain social and environmental conditions that could cause toxic stress, they are better able to cope with such conditions. This could be a sign of resilience building in the long-term in these youth.

The comments also reveal that the youth considered OTR to have a mitigating influence on toxic stress responses and their functioning across several social environments. In terms of relationships with family, many participants reported that their behavior at home had improved since starting at OTR. Not talking back as much, not slamming doors, being able to control anger, and better management of stress highlight improved emotional regulation abilities gained through participation in OTR.

*e) Impact of the OTR Program*

Analysis of the interviews revealed several key themes of how the OTR program has positively impacted the lives of participating youth relating to school performance, family dynamics, peer relationships, and overall health. Youth described in detail how OTR has positively impacted their dietary habits and associated health conditions. Participant comments such as "Ms. Deb and Ms. Kathy make me more healthy. They encourage me to eat more vegetables and healthier food" demonstrate the impact of OTR on their dietary health and food habits. Overall, the youth were able to make connections between their participation in the program and improved dietary health. The dietary health impacts are discussed in detail in other published work by these authors.

*f) Impact of OTR on School Performance and Attendance*

Many youth described how OTR has positively impacted their school performance and attendance. In discussing these changes, youth conveyed an increased sense of confidence and knowledge that doing well in school was important. One youth commented that "Before I started at On The Rise, I was absent all the time. Because before I started On The Rise, I used to skip school. I used to skip school when I lived with my mom. I used to skip school when I lived with my dad before I started coming to On The Rise." Another youth noted that "Last year, my attendance was horrible, and it is much better this year."

Youth comments also demonstrate perceived positive impacts on grades. One youth described that "Yeah, I have more confidence in what I was working on and my grades have gotten better. Umm… it's changed a lot. I didn't want to be there, but now I want to be at school." Comments such as "Yes, I've seen that my grades are increasing because I've gotten a lot of help from the Wittenberg students, and they are really teaching me. They don't give me the answers. They help me to really understand the work" demonstrate perceived improved self-confidence in school work through the academic assistance youth receive at OTR.

*g) Impact of OTR on Family Dynamics*

In addition to the comments already outlined in the toxic stress responses of the youth section, participants also reported how experiences at OTR have helped build relationships with family members. One participant's father was described as being a good cook who had a cooking degree, and the youth reported that one of the benefits of participation in OTR was telling their dad how to bake and that they baked a pie together for the dad's birthday. Similarly, another participant commented "It has helped me with my relationship with my mom… OTR has helped me like since I am not the only one with a parent like this, it helped me to connect and understand what is going on and about addiction and everything, so it helped me to connect with a lot of people." These comments demonstrate how OTR helps the youth develop a sense of empathy and better understanding about what they are experiencing in their lives.

*h) Impact of OTR on Peer Relationships*

With regard to peer relationships, many youth discussed how working together to accomplish tasks such as caring for the chickens, enabled them to develop stronger friendships. Youth also described how knowing they are all going through similar experiences helped them connect better with their peers. For example, one youth noted that "I can connect with most



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people and understand what they are going through and I am learning to be more open to people for most of my feelings I was keeping inside but once I found most people do understand what I am going through I would be more open and not have these feelings all balled up like one huge ball inside of me." Similarly another youth commented that "It's helped me understand other points of views and sides because, like I haven't ever known other kids my age have other issues. I really just thought it was sometimes just me." Beyond being around other youth who are struggling with similar issues, participants reported that improved emotional regulation abilities helped them maintain friendships. For example, one participant stated that "I haven't been flipping out on my friends. It's built me up to be a better person." Overall, youth perceived that participation in OTR improved their peer relationships through getting to know others in similar situations and better emotional regulation abilities. Although there was variation in responses, youth generally described that their experiences at OTR had positive influences on family relationships, peer interactions, and school performance. Participants described greater self-confidence, greater awareness of peers going through similar experiences, better emotional regulation abilities, and greater understanding of their life experiences as contributing towards positive impacts of the OTR program. Youth comments elucidate five key characteristics and attributes of the OTR program that they liked, enjoyed, and perceived as important, as described in more detail below.

*i) Importance of Nurturing Mentor Relationships at OTR*

One of the significant themes that arose during the interviews was the perceived nurturing mentor relationships the co-directors of the OTR program have developed with the youth. Youth described the co-directors, with descriptions such as "She is like my third mom, I have my mom, and my stepmom and she treats us like we are her children." They also frequently named the OTR leaders as being people they can trust and talk with. For example, one youth noted that "Ms. Deb and Ms. Kathy, so even if they haven't gone through it they have had this program for 13 or 14 years and have had a lot of kids like me and they also had my cousin which was going through the same thing with his dad." These comments demonstrate that the youth felt the OTR leaders cared about their well-being and understood the experiences they were going through.

*j) Importance of a Conducive Environment to Build Relationships with Peers*

Several participants described how the environment at OTR was conducive for connecting and building relationships with other program participants. For example, one participant commented that "I am usually very shy around new people. When I first came here I didn't talk at all. People started talking to me so I talked back and I made friends." Comments such as "It makes my day to come to the farm because like I like experiencing it with people I know, some of the people I used to hang out with. Knowing that they are here, and they are getting help. That is what made me build up my confidence to continue coming here" demonstrate having people they already knew also helped certain participants feel comfortable. Another participant similarly described that "At first I was nervous, it was my first day. I didn't know who all was going to be on the van. But when my cousin opened the van, I was like 'wow. My cousin is awesome.' And it made my day, because I haven't seen her in a long time." Youth perceived that accomplishing tasks together developed a sense of collective responsibility and accomplishment exemplified in comments such as "I think about how we made the food and how we all cook together. It is fun" and "We help prepare dinner, and we wash our hands before that. I think that we are learning to take care of our responsibilities and how to do one task at a time. To stay focused and not to get off track or you'll forget to do something."

*k) Importance of an Emotionally Comforting Environment: No Judgement Zone*

Several youth described how they perceive OTR as providing an emotionally comforting environment. Youth comments such as "It made us stronger because now we're all here and we can be more persistent and we can be a happy family" demonstrate affinity of the youth to OTR. One participant appreciated the comfortable atmosphere at OTR by acknowledging that "It's a no judgement zone. If you get judged here, they're probably really not meaning to judge you, they're probably just saying something. That's what makes me feel comfortable." Another youth commented that "I feel good about what I eat here, because I don't have people nitpicking about how I eat and how I chew my food." These comments elucidate the nature of the overall emotional environment at OTR, which made them feel comfortable and relaxed.

*l) Importance of the Farm Environment and the Interactions with Animals*

In particular, many of the youth appreciated the agriculture focus, farm-like atmosphere at OTR, and opportunities to interact with animals. All the youth expressed strong affinity towards farm animals and appreciated how their diligence benefited the animals. For example, one participant commented, "That's what I like about being here. We get to associate with the animals. And we get to help them…And we get to make the food…We get to experience the farm life. And I always wanted to be a farm girl…I love animals, I just don't like the way some of them are treated. And that's what ties me into this, because I don't like the way I've been treated. It just ties in together." Another youth described how interacting with animals help with certain

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medical conditions by stating that "I have ADHD and I'm diagnosed with it and sometimes I just get off track and not pay attention. I was mostly excited to come here because the animals."

*m) Importance of Doing Enjoyable Tasks and Gaining Transferable Skills*

The participants highlighted how they enjoyed the different activities they do at OTR such as taking care of animals, preparing food, eating healthy, accomplishing tasks, and connecting with peers build self-confidence how such skills were useful and applicable in other environments. For example, one participant noted that "Yes, because we have chickens at home. I wasn't eating any eggs from the store. I'm the only one that takes care of the chickens. I learned how to take care of our chickens. I mix their food together. I mix their scratch grain with their chick scratch grain to help – chick scratch helps produce the eggs better so they are more healthier for us to eat." Similarly, another participant described "since I've been here we've been eating healthier at home. We started a little earlier than that – maybe like a week or two before I started the program but mainly since I've been here, we've been eating more healthier. Youth comments such as "OTR is fun. It is better than other places I go. It is better than STARS because you do more stuff then just play, do homework, and go home. And you meet more people here" demonstrate how youth enjoyed the tasks and activities at OTR.

The data presented and synthesized above demonstrates that the youth endured several social and environmental conditions that could contribute to toxic stress. Youth also described several toxic stress responses in their day to day lives. Youth comments highlight three areas where they perceived experiencing positive outcomes (such as school performance, family, dynamics, and peer relationships) and five OTR program attributes collectively contributing to positive outcomes.

## V. Discussion

The at-risk youth described social and environmental conditions pertaining to family, neighborhood, school, and peer environments similar to those outlined in the literature as causing toxic stress. Dysfunctional family environments and bullying at school were the most frequently described negative social and environmental conditions of the youth. Bullying experienced at school as a perceived cause of toxic stress presents a significant implication for educators and teachers. One participant described how creation of a website to report bullies helped to reduce the bullying experienced by the participant. Educators must take all possible measures to address and minimize instances of bullying. Literature outlines certain behavioral, emotional, achievement related, and health dynamics (such as poor dietary habits, risky sexual activity, underage drinking, substance abuse, lower educational performance, and other illnesses) as toxic stress responses. The toxic stress responses described by the youth in this study while similar in health dynamics, explicate several emotional toxic stress responses such as feeling irritated, feeling upset, acting rude, self-harming, and displaying anger. Practitioners and adults working with at-risk youth could pay greater attention to these emotional toxic stress responses. The descriptions and data demonstrate that the youth perceived the experiences at OTR helped them positively transform their relationships with family and peers. The emotional dynamics elucidated by experiences of youth at OTR such as feeling comfortable, feeling of not judged, and feeling the co-directors cared about them could be critical to mitigating emotional toxic stress responses. Future research could further identify specific program characteristics that contribute to emotionally comforting environments that could mitigate toxic stress.

Franke (2014) highlights the importance of developing screening tools that could to be used for toxic stress. This study demonstrates the usefulness of a SDH based questionnaire to screen for pertinent social and environmental conditions and for toxic stress responses. Usefulness and appropriateness of SDH based questionnaires as a pertinent screening tool for toxic stress should be explored in future research.

In the interviews, participants described numerous examples of how participating in the OTR program has mitigated toxic stress responses. Several areas were perceived to be positively impacted through experiences at OTR program such as improved school attendance and performance; improved family relationships; improved health outcomes; and better peer relationships. Further, participants noted that they are attending school more regularly, are doing better in school, and are experiencing stronger peer and family relationships. Finally, they explained that greater self-confidence, greater awareness of peers going through similar experiences, better emotional regulation abilities, and greater understanding of their life experiences as contributing towards the positive outcomes.

Youth identified five key attributes and characteristics of the OTR program that they liked, enjoyed, and perceived as important. Research suggests a nurturing environment, reinforcement of positive behavior, learning new activities, planning for the future, and a mentor/mentee aspect are important to incorporate into programs targeting at-risk youth (Daud & Carruthers, 2008; McDaniel et al., 2015). The findings of this study show the importance of nurturing mentor relationships, a conductive environment to build relationships with peers, an emotionally comforting environment, the interactions with animals, and doing enjoyable tasks and gaining transferable skills as well as



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highlight how a holistic program environment could mitigate toxic stress and achieve targeted educational, behavioral, health, and relationship outcomes.

Rodríguez-Planas (2014) notes that certain mentoring programs tend to be better at improving youth's social skills than their academic performance. The two most frequently described positive program attributes were the nurturing mentorship the co-directors of the OTR program have with the youth and the opportunities to care for the farm animals. Perhaps most interestingly, participants used kinship terms to describe their relationships with the program co-directors such as "mom." As research on resilience in youth indicates, one of the most important factors in developing resilience is a supportive relationship with an adult. The OTR program demonstrates that it's possible to achieve multiple positive outcomes.

The structure, environment, and delivery dynamics of the OTR program elucidate several lessons for policy makers, practitioners, and researchers designing similar programs for at-risk youth. First, the OTR program highlights the importance of designing tailored programs to better suit the needs of particular youth when trying to address toxic stress. Findings exemplify the youth desiring happy/comfortable social environments and/or longing for adults they could trust and talk to and how the youth appreciated OTR providing such conditions. Second, the OTR program demonstrates the importance of incorporating programmatic activities that the youth enjoy doing and are transferable in other environments. Many participants of the OTR program described a close affinity to the farm animals and described how they enjoyed caring for farm animals. Several participants also described how they used such skills and knowledge gained in their family environments. In addition, participants felt they had positive relationships with peers and were productively engaged in completing chores around the farm. All these dynamics collectively created a program experience the participants enjoyed and looked forward to.

Findings of this study are also consistent with other studies such as Dickey et al. (2020) who found an agricultural program encouraged prosocial development in youth. Several studies have explored the effects of community gardens or outdoor-based programs on social, academic and emotional behaviors in at-risk youth (Berezowitz et al., 2015; Ruiz-Garllado & Reyes, 2013; Chawla et al., 2014, Dickey, 2020). Across studies, participating youth report improved academic outcomes, social relationships, and coping strategies related to stress. However, most of the studies were within a school setting and lacked the imagery of a comfortable home-like environment. The findings of this study highlight the importance of creating more farm, garden, or outdoor based programs for at-risk youth. OTR program dynamics such as hands-on agricultural experiences, adult mentorship, opportunities to interact with animals, and promotion of peer interactions could be replicated in other settings.

Although pertinent research and the findings of this study imply that programs could mitigate toxic stress responses, there is currently a lack of empirical evidence to determine a causal relationship between program participation and mitigated toxic stress responses, as well as measures that isolate the aspects of the program that have greater effects on mitigating toxic stress responses. Therefore, a limitation of this study setting is the inability to truly measure a causal relationship and to generalize the results onto other populations. Pre- and post-measures are not feasible in the research project setting due to the timing of youth entry and exit; not all youth start and end the program at the same time or stay in the program for the same amount of time, complicating a pre-post measure design. Further, the sample size is too small to examine quantitative associations between social support, environment, and health factors. Future research should continue to explore the impact of agricultural-based after-school programming on at-risk youth in terms of building resilience, mitigating toxic stress responses, and thereby promoting resilience and overall well-being. Research design considerations could include pre-post measures, longer-term post-measures to assess long-term impact, and larger sample sizes. It could be contributory to compare similar programs and to identify what attributes or program dynamics seem particularly effective. Future research that could contribute in other ways to the identification of particularly efficacious program dynamics is also warranted.

## VI. Conclusion

Using a phenomenology based approach, this study sought to explore multiple questions pertaining to toxic stress in at-risk youth and understand how the OTR program addresses toxic stress. The research team believes that the SDH questionnaire and semi-structured interviews complimented to discover pertinent experiences of at-risk youth and enabled a rich understanding of the dynamics of toxic stress experienced by the participants. The findings highlight that the youth endured several social and environmental conditions that could contribute to toxic stress. Youth also described several toxic stress responses in their day to day lives. Youth comments exemplify three areas where they perceived experiencing positive outcomes (such as school performance, family, dynamics, and peer relationships) and five OTR program attributes collectively contributing to positive outcomes. Future research should continue to explore the impact of agricultural-based programming for at-risk youth.



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