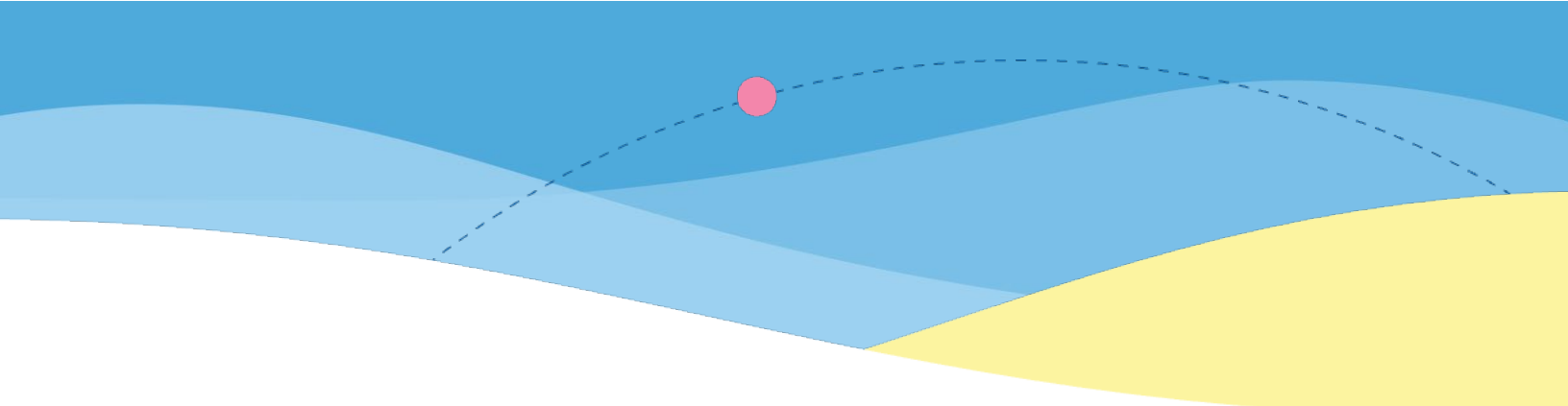




PRE-ANALYSIS PLAN

Psychosocial and economic returns to workforce development programs (WORKS Study)

July 23, 2026

I. Summary

This document presents a pre-analysis plan for a study evaluating the causal effects of participation in a nationally recognized, employer-driven workforce development program (The Skills Initiative, SI, based in Philadelphia) on psychosocial well-being, economic outcomes, job quality, and health.

II. Data

Our quantitative study will leverage original survey data, collected between 2025-2027. (see Appendix for the baseline survey instrument). Baseline surveys will be conducted onsite at SI at the participants' interview day. Follow-up surveys will be conducted over telephone. In the event of high rates of attrition, we may also pursue provision of email and text links for participants to complete surveys on their own time. Brief details of the surveys are as follows:

- a. Baseline survey, conducted onsite, prior to notification of selection into SI
- b. Follow-up surveys at 3, 6, 9, and 12 months.
- c. Depending on budget and attrition, we will evaluate the possibility of extending the study to 18 and 24 months. If the study is extended, follow-up would go through 2028.
- d. Surveys will include validated psychosocial, economic, job quality, and health measures (see Section III and Appendix).

Our study also includes a qualitative component, conducted over the period 2026-2027. This will include semi-structured interviews with ~20 participants selected into workforce development and ~10 comparison participants who were not.

We will also have access to administrative data from SI, including application records, interview and program selection status, employment histories, and job placement and retention data (among those selected into SI). These data will be used to ascertain exposure (see below) and will be used to help interpret findings from the quantitative and qualitative analyses.

III. Outcomes and Exposure

III.a. Primary Outcome

Our primary outcome will be a Psychosocial Well-Being Index, composed of the following measurements (see Appendix for survey instruments):

- a. State Hope Scale
- b. Perceived Stress Scale
- c. Kessler-6 Psychological Distress Scale
- d. Cantril Life Satisfaction Ladder

We will compute this index using the method of Anderson (2008), which involves four steps. First, component variables are ordered such that higher values consistently reflect better outcomes. Second, each variable is standardized (mean = 0, standard deviation = 1). Third, we will calculate the covariance matrix for the standardized component variables. Finally, we will create a summed index of the component variable using inverse covariance weights.

III.b. Secondary outcomes and mechanisms

We will consider the following secondary outcomes, some of which comprise mechanisms. We will compute these indices using same Anderson (2008) method as above.

1. Economic Well-Being Index
 - a. Monthly income
 - b. Annual household income
 - c. Consumer Financial Protection Bureau Financial Well-Being Scale
2. Labor Market Index
 - a. Employment status (currently employed versus not)
 - b. Labor force participation (currently employed or searching for work versus not)
 - c. Annual personal income
 - d. Employee benefits (number of different benefits included in job)
 - e. Job satisfaction scale
 - f. Job stress
3. Health Index
 - a. Self-reported general health (5-point Likert Scale)
 - b. Days of poor physical health
 - c. Days of poor mental health
 - d. Days unable to work because of poor health
4. Future Expectations Index
 - a. Future life satisfaction
 - b. Perceived general social mobility
 - c. Perceived individual social mobility

While the Anderson (2008) approach allows for missingness, in the event of significant missingness (for example, in income measures) we will remove that particular measure from the index. Our pre-specified threshold for significant missingness for a specific variable will be 10%.

III.c. Exposures

Our main exposure is selection for participation in an SI training cohort. This exposure captures both psychological pathways that link opportunities for upward mobility and the expectations formed as a result of those opportunities to well-being, as well as the material impacts of participation in workforce development. A study participant is considered “treated” upon being told that they have been selected for an upcoming SI training program. Selection typically occurs around 1 week after the baseline surveys (which are timed with participant interviews) are conducted. A study participant is categorized as in the control group if they are told they are not selected for the program. Control participants may apply to later SI training opportunities. If they are selected at that time, they will be considered treated in all time points thereafter.

IV. Research Design:

IV.a. Main approach

We will use a quasi-experimental difference-in-differences design leveraging SI's competitive selection process.

SI receives ~800–1,000 applications per training opportunity. Of these, 40–50 applicants are invited to interview per training cohort, and 15–20 applicants are ultimately selected to participate in training. Among the relatively small pool of interviewees, selection into SI is driven largely by employer-specific capacity constraints and idiosyncratic needs, generating quasi-random variation in access to training.

For each of the outcomes, we will estimate the following difference-in-differences model:

$$Y_{it} = \beta_1 \text{Treat}_{it} + \gamma_c + \pi_t + \mu_i + e_{it} \quad (1)$$

where i denotes the individual, c denotes calendar time, and t denotes time marked in study intervals (i.e., baseline = 0 for all participants regardless of calendar time). Y_{it} denotes the outcome of interest, γ_c are fixed effects for quarter-year (calendar time), π_t represent fixed effects for survey wave (e.g., baseline, 3, 6, 9, 12 months), and μ_i are individual fixed effects. Treat_{it} refers to a binary indicator denoting participant knowledge that they have been accepted into an SI cohort (as defined in the Exposure section above). The coefficient β_1 recovers the average effect of program acceptance on the outcome across all post-acceptance survey waves. Thus, β_1 can be interpreted as the average intention-to-treat (ITT) effect of being offered access to the program over the study period. By pooling observations across follow-up waves, this specification maximizes statistical power while leveraging the repeated-measures design.

We will also estimate dynamic versions of Equation (1) as a secondary analysis:

$$Y_{it} = \sum_{\tau=3}^{12} \theta_\tau (\text{Treat}_i \times 1[\text{Wave}_{it} = \tau]) + \gamma_c + \pi_t + \mu_i + e_{it} \quad (2)$$

Here the objects of interest are the coefficients θ_τ , which plot the dynamic evolution of the outcome in treatment versus control across survey waves (the baseline period, which is omitted, serves as the reference).

We will adjust standard errors for clustering at the individual level. For inference, the index approach provides an omnibus test that addresses multiple comparisons for the primary outcome. For the secondary outcome and individual measures within each of the primary and secondary outcome indices (which may be of individual interest) we will adjust p-values to control for the share of false discoveries (following the approach of Anderson 2008, which applies the approach of Benjamini and Hochberg 1995).

IV.b. Sensitivity Analyses

We will consider the following specification checks depending on enrollment patterns into SI and attrition.

Enrollment patterns: It is possible that some participants may not be selected to SI at baseline but apply later and be selected for a subsequent cohort. This potential staggered adoption can introduce bias into the Equations (1) and (2). In the event staggered adoption, we will estimate, as a robustness check, Equations (1) and (2) using Gardner et al's two-stage difference-in-differences approach.

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Attrition: We investigate and report attrition rates overall and separately by treatment status at each survey wave. We will test for differential attrition across treatment and control groups and assess whether baseline demographic and psychosocial characteristics (alone and interacted with treatment) predict survey completion. Because treatment may affect retention or survey participation, attrition will also be analyzed as an outcome of substantive interest.

Our primary analyses will use all available observations under the assumption that outcomes are missing at random conditional on fixed effects and treatment status. Participants who miss an intermediate survey wave but subsequently return will be included in all analyses using their available observations.

We will report overall and treatment-specific attrition rates at each survey wave and assess whether attrition is systematically related to treatment status or baseline characteristics. If attrition is substantial or differs across treatment arms, we will implement additional robustness analyses tailored to the observed patterns of missingness.

In settings where differential attrition is consistent with a monotonic selection process, we will estimate Lee bounds to characterize the range of treatment effects consistent with the observed attrition patterns. However, the monotonicity assumption may not hold in our setting if, for example, successful program participants become less likely to complete follow-up surveys because they enter employment or experience other time constraints.

In cases where attrition appears to be driven by more general selection processes, we will consider recently developed approaches for handling attrition in difference-in-differences settings, including the changes-in-changes framework proposed by Ghanem et al. (2024). Identification of the resulting treatment effect parameter (ATT-R) requires assumptions regarding the evolution of unobserved determinants of attrition over time and the relationship between these unobservables and untreated potential outcomes. We therefore view these estimates as complementary robustness analyses rather than replacements for our primary specification.

Heterogeneity: If attrition is modest, we will attempt to examine treatment effect heterogeneity using Bayesian Additive Regression Trees (BART). These analyses will be considered exploratory. We will also assess heterogeneity for two specific subgroups: men versus women and participants with high school degrees versus associates degrees or higher.

IV.b. Sample and Power

Our targeted sample size is 300-400 participants, which is what we expect to attain with recruitment through December 2026. This timeline and target is based on budgetary constraints. We expect roughly half of the enrollment participants to be in treatment and half in control, though this will depend on SI and employer specific factors such as number of training slots and potential for enrollment in future cohorts. We will follow participants for 12 months (with, as before, the option of moving to 24 months depending on funding and attrition).

Using the approach of Hu and Hoover (2018) to calculate power in non-randomized longitudinal difference-in-differences studies, assuming an alpha of 0.05 and power of 0.80, 1 pre-intervention period (baseline) and 4 post-intervention periods (3, 6, 9, and 12 months), a sample size of 150 per arm ($n=300$), and a conservative ICC of 0.05, we will be powered to detect effects at 0.24 SD. With 200 participants per arm ($n=400$), we would be able to detect effects at 0.21 SD. Assuming significant attrition of 1/3 by endline (from a sample of $n=300$), we would still be able to detect effects at 0.28 SD.

V. References

1. Anderson, M.L. (2008). "Multiple inference and gender differences in the effects of an early intervention: A re-evaluation of the Abecedarian, Perry Preschool, and Early Training Projects." *Journal of the American Statistical Association* 103: 1481-1495.
2. Benjamini, Y. and Hochberg, Y. (1995). "Controlling for the False Discovery Rate: A practical and powerful approach to multiple testing." *Journal of the Royal Statistical Society B* 57: 289-300.
3. Gardner, J., Thakral, N., To, L.T., and Yap, L. (2024). "Two-stage difference-in-differences." *Mimeo*, Boston University.
4. Ghanem, D., Hirschleifer, S., Kedangi, D., and Ortiz-Becerra, K. (2024). "Correcting attrition bias using changes-in-changes." *Journal of Econometrics* 241: 105737.
5. Hu, Y., and Hoover, D.R. (2018). "Simple power and sample size estimation for non-randomized longitudinal difference-in-differences studies." *Journal of Biometrics and Biostatistics* 9: 415.

Appendix A: Baseline Survey Instrument

The baseline survey instrument below is reproduced as administered via REDCap.

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Baseline Survey

Please complete the survey below.

First Name

Last name

Date of Birth

What is your address of residence?

Street: _____
City: _____ State: _____ Zipcode: _____

If other, please specify

What is the best number to reach you at?

What is the best email address to reach you at?

How do you identify?

- ☐ Female
- ☐ Male
- ☐ Nonconforming
- ☐ Other

Which category best describes you?

- ☐ Black
- ☐ White
- ☐ Hispanic or Latino/a
- ☐ Asian or Pacific Islander
- ☐ American Indian or Alaskan Native
- ☐ Other

If other, please specify:

What is your marital status?

- ☐ Married
- ☐ Divorced
- ☐ Widowed
- ☐ Separated
- ☐ Never married
- ☐ A member of an unmarried couple
- ☐ Decline

What is the highest level of education you have completed?

- ☐ Less than high school
- ☐ High school graduate or GED
- ☐ Technical or vocational training
- ☐ 2-year degree
- ☐ 4-year college degree
- ☐ Graduate or professional degree

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The next few questions are about your overall health.

Would you say that in general your health is

☐ Excellent
☐ Very good
☐ Good
☐ Fair
☐ Poor

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good? ((0-30) days)

Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good? ((0-30) days)

During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation? ((0-30) days)

During the last 30 days, about how often did you feel:

Nervous?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

Hopeless?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

Restless or fidgety?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

So depressed that nothing could cheer you up?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

That everything was an effort?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

40. Worthless?

☐ All of the time
☐ Most of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

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In the last 6 months, how many times did you go to a doctor's office, clinic, or other health care provider to get care for yourself? Don't include hospital and emergency room visit or dental care. Your best estimate is fine.

☐ None
☐ 1 time
☐ 2 times
☐ 3 or more times

If 3 or more times, please specify how many times:

In the past 6 months, how many times did you go to the emergency room to get care for yourself?

☐ None
☐ 1 time
☐ 2 times
☐ 3 times or more

If 3 times or more, please specify how many times:

The most recent time you went to the emergency room, what was the reason you went there instead of somewhere else for health care? Mark all that apply

☐ I needed emergency care
☐ I didn't have insurance
☐ Doctor's offices/clinics were closed
☐ I couldn't get an appointment to see a regular doctor soon enough
☐ I didn't have a personal doctor
☐ I couldn't afford the copay to see a doctor
☐ I needed a prescription drug
☐ I didn't know where else to go
☐ Some other reason
☐ I don't know
☐ I haven't gone to the emergency room in the last 6 months

If some other reason, please specify why:

In the last 6 months, how many different times were you a patient in a hospital at least overnight? Do not include hospital stays to deliver a baby.

☐ None
☐ 1 time
☐ 2 times
☐ 3 or more times

If 3 or more times, please specify how many times:

If you needed medical care in the last 6 months, did you get all the care you needed?

☐ Yes
☐ No
☐ I didn't need care in the last 6 months

Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans, such as Medicare, or Indian Health Service?

☐ Yes
☐ No
☐ Don't know/not sure
☐ Refused

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The next set of questions are about your employment and income.

Are you currently in school or working?

- ☐ I am in school
☐ I am working
☐ I'm both in school and working
☐ No, I'm not in school or working

Which best describes your current workplace(s)? Mark all that apply.

- ☐ For-Profit company or organization
☐ Non-Profit organization (including tax exempt and charitable organizations)
☐ Local Government (for example: city or county school district)
☐ State Government (including state colleges/universities)
☐ Active Duty (U.S. Armed Forces of Commissioned Corps)
☐ Federal Government (Civilian employee)
☐ Owner of non-incorporated business, professional practice, or farm
☐ Owner of incorporated business, professional practice, or farm
☐ Worked without pay in a for-profit family business or farm for 15 hours or more per week
☐ Self-employed
☐ Other

If other, please specify

Which of the following best describes your work schedule at your current job? Mark all that apply.

- ☐ Variable
☐ Regular daytime schedule
☐ Regular evening shift
☐ Regular night shift
☐ Rotating shift (one that changes regularly from days to evenings or nights)
☐ Split shift (one consisting of two distinct periods each day)
☐ Other
☐ Don't know/Refuse

If other, please specify

About how many hours per week, on average, do you work at your current job(s)?

- ☐ 0-9 hours per week
☐ 10-19 hours per week
☐ 20-29 hours per week
☐ 30-39 hours per week
☐ 40 or more hours per week

Please share how much you agree or disagree with this statement:

- ☐ Strongly agree
☐ Agree
☐ Disagree
☐ Strongly disagree

I would like to work more hours at my current job

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How true or not true is this statement for you at your current job?

- ☐ Always true
☐ Often true
☐ Sometimes true
☐ Never true

My shift and work schedule at my current job cause extra stress for me and my family

Please look at the following list of benefits that employers sometimes make available to their employees. Which of the benefits on the list can you receive as part of your job? Mark all that apply.

- ☐ Paid sick days
☐ Paid vacation days
☐ Health plan or medical insurance
☐ Dental benefits
☐ Paid maternity or paternity leave
☐ Unpaid maternity or paternity which would allow you to return to the same job, or one similar to it
☐ A retirement plan other than Social Security
☐ None of these

All in all, how satisfied would you say you are with your current job?

- ☐ Very satisfied
☐ Somewhat satisfied
☐ Not too satisfied
☐ Not at all satisfied

During the last 3 months, what were ALL the sources of your income? Check ALL that apply

- ☐ A job
☐ Unemployment
☐ TANF (cash assistance/welfare)
☐ SNAP (food stamps)
☐ WIC
☐ Veteran's benefits
☐ Disability or social security
☐ Other govt sponsored assistance programs
☐ Spouse, intimate partner, family or friends
☐ Alimony or child support

Which best describes your workplace in the last 3 months?

- ☐ For-Profit company or organization
☐ Non-Profit organization (including tax exempt and charitable organizations)
☐ Local Government (for example: city or county school district)
☐ State Government (including state colleges/universities)
☐ Active Duty (U.S. Armed Forces of Commissioned Corps)
☐ Federal Government (Civilian employee)
☐ Owner of non-incorporated business, professional practice, or farm
☐ Owner of incorporated business, professional practice, or farm
☐ Worked without pay in a for-profit family business or farm for 15 hours or more per week
☐ Self-employed
☐ Other

If other, please specify

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During the last 3 months, what was the MAIN source of your income? Choose ONE

- ☐ A job
- ☐ Unemployment
- ☐ TANF (cash assistance/welfare)
- ☐ SNAP (food stamps)
- ☐ WIC
- ☐ Veteran's benefits
- ☐ Disability or social security
- ☐ Other govt sponsored assistance programs
- ☐ Spouse, intimate partner, family or friends
- ☐ Alimony or child support

In the past 12 months, what was your combined household income, including the income from all people who lived in the household?

- ☐ Less than \$15,000
- ☐ \$15,000-\$24,999
- ☐ \$25,000-\$34,999
- ☐ \$35,000-\$44,999
- ☐ \$45,000-\$54,999
- ☐ \$55,000-\$64,999
- ☐ \$65,000-\$74,999
- ☐ \$75,000-\$84,999
- ☐ \$85,000 or more
- ☐ Prefer not to answer

In the past 12 months, what was your personal income, not including income from other members of your household?

- ☐ Less than \$15,000
- ☐ \$15,000-\$24,999
- ☐ \$25,000-\$34,999
- ☐ \$35,000-\$44,999
- ☐ \$45,000-\$54,999
- ☐ \$55,000-\$64,999
- ☐ \$65,000-\$74,999
- ☐ \$75,000-\$84,999
- ☐ \$85,000 or more
- ☐ Prefer not to answer

What was your total personal income last month? Your best estimate is fine.

(Please respond for the previous month)

Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. Suppose we say that the top of the ladder represents the best possible life for you, and the bottom of the ladder represents the worse possible life for you.

On which step of the ladder would you say you personally feel you stand at this time?

- ☐ 10
- ☐ 9
- ☐ 8
- ☐ 7
- ☐ 6
- ☐ 5
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1
- ☐ 0

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- On which step do you think you will stand on in the future, say about five years from now?
- ☐ 10
 - ☐ 9
 - ☐ 8
 - ☐ 7
 - ☐ 6
 - ☐ 5
 - ☐ 4
 - ☐ 3
 - ☐ 2
 - ☐ 1
 - ☐ 0

On the following scale, please rate your level of agreement with the following statements.

- There are a lot of opportunities for people to move up the social ladder
- ☐ Strongly Disagree
 - ☐ Disagree
 - ☐ Somewhat Disagree
 - ☐ Neither Agree nor Disagree
 - ☐ Somewhat Agree
 - ☐ Agree
 - ☐ Strongly Agree

-
- In today's society, I can change my social class
- ☐ Strongly Disagree
 - ☐ Disagree
 - ☐ Somewhat Disagree
 - ☐ Neither Agree nor Disagree
 - ☐ Somewhat Agree
 - ☐ Agree
 - ☐ Strongly Agree

Read each item carefully. Please take a few moments to focus on yourself and what is going on in your life at this moment. Once you have this "here and now" mindset, go ahead and answer each question according to the scale.

- If I should find myself in a jam, I could think of many ways to get out of it
- ☐ Definitely False
 - ☐ Mostly False
 - ☐ Somewhat False
 - ☐ Slightly False
 - ☐ Slightly True
 - ☐ Somewhat True
 - ☐ Mostly True
 - ☐ Definitely True

-
- At this present time, I am energetically pursuing my goals
- ☐ Definitely False
 - ☐ Mostly False
 - ☐ Somewhat False
 - ☐ Slightly False
 - ☐ Slightly True
 - ☐ Somewhat True
 - ☐ Mostly True
 - ☐ Definitely True

-
- There are lots of ways around any problem that I am facing now
- ☐ Definitely False
 - ☐ Mostly False
 - ☐ Somewhat False
 - ☐ Slightly False
 - ☐ Slightly True
 - ☐ Somewhat True
 - ☐ Mostly True
 - ☐ Definitely True

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Right now, I see myself as being pretty successful	☐ Definitely False ☐ Mostly False ☐ Somewhat False ☐ Slightly False ☐ Slightly True ☐ Somewhat True ☐ Mostly True ☐ Definitely True
--	--

I can think of many ways to reach my current goals	☐ Definitely False ☐ Mostly False ☐ Somewhat False ☐ Slightly False ☐ Slightly True ☐ Somewhat True ☐ Mostly True ☐ Definitely True
--	--

At this time, I am meeting the goals that I have set for myself	☐ Definitely False ☐ Mostly False ☐ Somewhat False ☐ Slightly False ☐ Slightly True ☐ Somewhat True ☐ Mostly True ☐ Definitely True
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The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, please indicate your response by selecting the option representing HOW OFTEN you felt or thought a certain way.

In the last month, how often have you felt that you were unable to control the important things in life?	☐ Never ☐ Almost never ☐ Sometimes ☐ Fairly often ☐ Very often
--	--

In the last month, how often have you felt confident about your ability to handle your personal problems?	☐ Never ☐ Almost never ☐ Sometimes ☐ Fairly often ☐ Very often
---	--

In the last month, how often have you felt that things were going your way?	☐ Never ☐ Almost never ☐ Sometimes ☐ Fairly often ☐ Very often
---	--

In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	☐ Never ☐ Almost never ☐ Sometimes ☐ Fairly often ☐ Very often
--	--

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How well does this situation describe your situation?

Within the past 12 months, you often worried that your food would run out before you got money to buy more

- ☐ Often true
☐ Sometimes true
☐ Never true

Within the past 12 months, the food you bought just didn't last and you didn't have money to get more

- ☐ Often true
☐ Sometimes true
☐ Never true

Because of my money situation, I feel like I will never have the things I want in life

- ☐ Completely
☐ Very well
☐ Somewhat
☐ Very little
☐ Not at all

I am just getting by financially

- ☐ Completely
☐ Very well
☐ Somewhat
☐ Very little
☐ Not at all

I am concerned that the money I have or will save, won't last

- ☐ Completely
☐ Very well
☐ Somewhat
☐ Very little
☐ Not at all

How often does this statement apply to you?

I have money left over at the end of the month

- ☐ Always
☐ Often
☐ Sometimes
☐ Rarely
☐ Never

My finances control my life

- ☐ Always
☐ Often
☐ Sometimes
☐ Rarely
☐ Never