Title: Differences in stress and sleep among recipients and non-recipients of 12 and 24 months of Guaranteed Income, a community-based study among Black women in Georgia

Authors:
Kaitlyn Stanhope, PhD a,b
Quiana Lewis, PhD, MPHc
Laura Brugger, PhDd
Leah Hamilton, PhD, MSWe
Stephen Roll, PhDd
Latrice Rollins, PhD, MSWf
Naomi Zewde, PhDg

a Emory University Department of Epidemiology, Rollins School of Public Health
b Emory University School of Medicine, Gynecology and Obstetrics
c Child Trends
d Center for Social Development, Brown School, Washington University in St. Louis
eAppalachian State University
fMorehouse School of Medicine
gUniversity of California, Los Angeles

Corresponding Author:
Kaitlyn K Stanhope
kkstanhope@emory.edu
ORCID: 0000-0003-1540-3059

Abstract

Objective: To estimate differences in mental distress, sleep quality, and sleep duration following twelve and twenty-four months of receipt of guaranteed income (GI) between program participants and a comparison group.

Methods: We conducted a community-engaged intervention study (In Her Hands) between 2022-2024 in Georgia, United States. Participants included self-identified Black women with income ≤ 200% of the federal poverty level who participated in follow-up surveys (12-month participation rates: intervention: 40.8%; control: 11.9%). GI recipients were selected via lottery; comparison participants were those not selected at baseline who completed follow-up surveys. We measured mental distress using the Kessler-10 and sleep quality and duration via the Pittsburgh Sleep Quality Index at 12- and 24-months following enrollment. We fit linear regression models using generalized estimating equations, accounting for site, age, and wave to estimate differences and 95% confidence intervals.

Results: We include 468 GI recipients and 374 controls (99.93% Black; mean age 37.0 years, median annual income: $11,400). Following 12 and 24 months of GI receipt, GI recipients reported improved sleep quality (24 month difference in PSQI score, -1.33 (-1.83, -0.82)) and reduced mental distress (24 month K10 difference: -3.99 (-5.45, -2.52)) but not significant differences in sleep duration (24 month difference: 0.22 (-0.15, 0.60).

Conclusions: At 12 and 24 months of GI, intervention participants reported higher sleep quality and lower mental distress compared to a comparison group.

Keywords: sleep health; social determinants of health; financial stress; unconditional cash transfer

Introduction

Poor sleep, as indicated by insomnia, obstructive sleep apnea, or short sleep duration, is associated with cardiovascular disease and its proximate causes, including obesity, hypertension, and diabetes.[1] Evidence suggests that sleep may be part of the explanation for the consistent disparities in cardiovascular outcomes across racial/ethnic, gender, geographic, and socioeconomic strata.[1–5] Indeed, poor sleep is more prevalent among racially and ethnically minoritized and low-income communities, with some potential mechanisms including increased exposure to stress, occupational characteristics, or exposure to noise pollution.[3] Sleep quality and duration vary across geography, race, gender, and socioeconomic strata.[3,6] People residing in the Southeast report the worst sleep compared to other regions in the United States.[3,4] Black women, in particular, are more likely to report poor quality sleep than White and male counterparts, possibly due to financial stress, gendered racism, and caretaking responsibilities.[3–5]

The social determinants of health, particularly financial security, impact all aspects of health and well-being. Financial strain is a particularly important risk factor for poor sleep.[5,7–9] Financial strain acts as a chronic stressor, adversely impacting sleep quality and duration. [5,7] Further, limited financial resources can act as barriers to optimal sleep habits, by reducing access to optimal sleep environments or forcing irregular sleep schedules due to shift work or long hours.[6,10] Although low-income groups and racial/ethnic minorities experience worse quality sleep, higher prevalence of sleep-disordered breathing, and shorter sleep duration than high-income and non-Hispanic White counterparts, these populations have the least access to sleep medicine and therapy for sleep disorders.[11–13]

While substantial and consistent evidence links the social determinants of health to sleep, few interventions have been developed and rigorously tested to intervene upon the social determinants of health, particularly among women and racial/ethnic minority communities.[14,15] Community-based prevention interventions focusing on the social determinants of health can potentially improve sleep.[11] One promising, cross-cutting intervention is guaranteed income. Guaranteed income (GI), also known as unconditional cash transfers, is an intervention in which a selected population receives set cash payments for an amount of time without any strings attached. GI directly addresses income stability and financial security.[16] Studies suggest that the majority of GI recipients use the funds to meet basic needs, including housing, food, and childcare, allowing GI to address multiple domains of social needs as prioritized by the individual.[17] Pilot studies from a variety of settings in the United States and other countries have shown that GI projects improve mental well-being, financial security, and housing insecurity.[17]

Despite a clear possibility of GI to improve physical health, evidence on the impact of GI on physical health is scant, particularly in the United States. One randomized trial in Stockton, CA, showed that GI recipients reported improved physical functioning after GI receipt, compared to controls.[18] GI receipt may improve sleep through multiple mechanisms, including decreasing stress, giving participants flexibility to move or alter their homes for more comfort, and allowing participants flexibility to choose a job with a schedule and/or commute conducive to a healthy sleep schedule.

Improving sleep has the potential to improve health across a variety of mental and physical domains, particularly in a community at high risk of poor sleep and cardiovascular disease.[11,19] In a 2023 review of community-based interventions to prevent cardiovascular disease, no interventions that targeted sleep were identified.[11] Understanding whether a community-led GI intervention can improve sleep among Black women can increase our understanding of the potential for community-based interventions to prevent cardiovascular disease and improve health more broadly.

We leverage a community-led GI project with a group of individuals who received two years of GI and a comparison group of individuals who applied for but were not selected by lottery to receive GI to estimate differences in (1) sleep duration and quality and (2) mental distress following twelve and twenty-four months of GI receipt among Black women residing in low-income neighborhoods in urban, suburban, or rural Georgia.

Methods

Study Design

This study draws from the In Her Hands initiative in Georgia, focused on addressing economic disparities among Black women through guaranteed income and evaluated via a mixed-methods community-based participatory research (CBPR) design. The program invited women from three Georgia communities (urban Old Fourth Ward of Atlanta, rural Clay-Randolph-Terrell counties, and suburban College Park) to participate in the GI program. Eligibility for the program required residency in these areas, female identification, a minimum age of 18, and an income not exceeding 200% of the Federal Poverty Level relative to family size. Of interested and eligible applicants, 684 were selected via a lottery in 2022. The selected individuals were then randomized into two treatment groups receiving differing cash transfer modalities: one with a consistent $850 monthly for 24 months, and the other with an initial $4300 followed by $700 for the subsequent 23 months. The current analysis does not examine differences by cash transfer modality; these groups are collapsed for the current analysis. Rather, we compare individuals who received either modality of GI to non-selected applicants. We retained contact

information for non-selected applicants and, at 12 months and 24 months post-baseline, invited them to participate in follow up surveys. We show study inclusion and exclusion in Figure 1.

The CBPR approach facilitated active community engagement in research formulation, ensuring the study's alignment with the participants' needs and context. Researchers met annually with participants and community advisory boards to co-design research questions and co-interpret findings. Ethical oversight was maintained with a university IRB exemption obtained in 2022.

Data Collection

All lottery entrants completed an initial program application. GI recipients were invited to complete surveys at baseline, six, and twelve months following the lottery. Both individuals selected to receive GI and those not selected were invited to participate in follow-up surveys at 12 and 24 months following the lottery (12-month participation rates: 40.8% and 11.9%, respectively; 24-month: 39.8% and 9.9%). Participants received $20 for survey completion. Surveys used in this analysis were completed in 2023 and 2024.

Sleep quality and duration

We measured sleep quality and duration using the Pittsburgh Sleep Quality Index (PSQI), a validated and reliable measure of sleep duration and quality.[20] We included the full index in the 12 and 24-month surveys for all participants. We present total scores for the PSQI and a binary version, with scores greater than or equal to 7 as an indicator of poor overall sleep quality.[20] Also, we present continuous sleep duration (in hours) and the proportion reporting short sleep (less than 6 hours) on average. To account for outliers in sleep duration, we truncated extreme responses at the 99th percentile.

Mental distress

To measure mental distress, participants completed the Kessler 10 (K10) scale, a validated measure of mental distress and mental illness.[21] The K10 scale includes questions that probe the frequency of various feelings associated with mental distress, such as nervousness, hopelessness, restlessness, and depressive symptoms over the past 30 days. Scores from the K10 can help identify individuals experiencing varying levels of psychological distress, ranging from mild to severe, providing an insightful cross-sectional snapshot of the participants' mental health status.

Potential mediator

We considered financial stress as a potential mediator of the effect of receiving guaranteed income on sleep duration, sleep quality, and mental distress. We included the question, "How difficult was it to pay bills in the past month?" as an indicator of financial strain. We considered responses of "not at all" as indicating the absence of financial strain.

Analysis

We present descriptive results stratified by intervention or comparison group. We calculated p-values using Mann-Whitney U tests for continuous variables and Chi-Square tests for categorical variables. Given that most of the continuous variables were not normally distributed, we present variables as medians and interquartile ranges for descriptive analysis. We consider p = 0.05 as the binary cut-off supporting statistical significance.

We fit linear regression models for each outcome separately, controlling for age, wave, and site. We used generalized estimating equations to cluster standard errors by participants and account for repeated measures. As an exploratory analysis, we used causal mediation analysis (allowing for exposure-mediator interaction) to estimate direct and indirect effects of guaranteed income, potentially mediated by the absence of financial strain at 12 months, on sleep duration, sleep quality, and/or mental distress at 24 months.[22] We fit linear models for the outcomes and logistic models for the mediator. For mediation models, we further adjusted for the number of children and income as potential confounders of the financial-strain and outcome relationship.

We conducted all analyses using Stata, version 18.[23]

Results

This study included 842 participants who completed either the 12-month or 24-month follow-up surveys (**Table 1**). Nearly all participants identified as non-Hispanic Black (98.93% overall), and households comprised a median of one adult and one child. Median annual household income was $11,400. Comparing information from the baseline application, GI recipients (n = 468) were similar to the comparison group (individuals not selected by lottery, n = 374) across number of children, race, income, and government benefit receipt.

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GI recipients reported a similar length sleep duration (6 (6,8) v. 6 (5, 8)), better sleep quality (median PSQI score, 8 (6, 11) v. 10 (7,12)), and lower mental distress (18 (13, 27) v. 22 (16, 29)) at 12 months than the comparison group (Table 2). At 24 months, GI recipients reported longer sleep duration (7 (6,8) v. 6 (5,8)), better sleep quality (8 (6, 10.5) v. 10 (8, 13)), and lower mental distress than the comparison

group. At both time points, a lower proportion of GI recipients reported that it was "very difficult" to pay bills in the past month. The proportion of participants reporting that it was very difficult to pay bills increased between 12 and 24 months in both groups.

Adjusting for site, wave, and age, GI receipt was associated with a lower (better) PSQI score (adjusted Beta: -1.33 (-1.83, -0.82) and a lower mental distress (K10) score (-3.99 (-5.45, -2.52)) (Table 3). While GI recipients had a longer sleep duration on average, this difference was not significant. In an exploratory mediation analysis, we found that the association between GI receipt and sleep quality and mental distress at 24 months was partially mediated by a lack of financial strain at 12 months (12 and 15% mediated, respectively, Table 4).

Discussion

In this randomized trial of GI among low-income Black women in Georgia, we identified improved sleep quality and lower mental distress among intervention participants relative to the comparison group, possibly mediated by decreased financial strain. After one and two years of GI receipt, intervention participants reported improved mental health and sleep and lower rates of financial strain relative to the comparison group. While differences could be due to chance, the two groups were remarkably similar at baseline on key demographic characteristics and differences in distress and were larger at 24 months compared to 12 months, supporting the hypothesis that the difference is due to GI receipt. These results represent the first large-scale trial of GI among Black women, a population that experiences persistent health disparities, including in sleep health.

Similarly to prior US-based research in Stockton, CA,[18] we identified positive effects on mental and physical health in this sample of Black women in Georgia, despite several notable design differences. For one, our study relied on self-referral, rather than randomly selected households, and restricted the study to low-income Black women. The consistency of results across these diverse settings and extension to sleep builds confidence in the capacity of GI to improve health.[17] To our knowledge, this is the first GI pilot to focus on sleep health as an outcome, despite biological plausibility.

GI receipt may result in improved sleep through several mechanisms. Prior research demonstrates that GI receipt alleviates financial insecurity and reduces stress.[17] Our results are consistent with these prior studies, as we observed lower mental distress (K-10) scores and a lower proportion of individuals reporting financial strain following 12 and 24 months of GI receipt versus the comparison group. This may improve sleep quality, in addition to documented effects on mental health. Second, GI recipients may

have more flexible financial and time resources to devote to their self-care, including health behaviors and preventive health care use. Third, while GI receipt is not associated with leaving the labor market, it is associated with greater flexibility in choosing employment.[17] GI recipients may be able to choose employment with either a better schedule and/or a shorter commute, resulting in more time for health-promoting behaviors, including sleep. Notably, in our study, we observed improved mental health and reduced financial strain in GI recipients compared to the comparison group. Together, these mechanisms suggest a large potential for GI to improve health immediately and over the long term. We did not identify meaningful differences in sleep duration between intervention and comparison group participants, nor was there evidence of mediation by lack of financial strain at 12 months. This suggests that sleep quality may be more sensitive to reductions in financial strain or stress. Future research should examine this relationship with more sensitive and accurate measures of sleep duration.

Georgia is a Southern state in the stroke belt, the region of the country with the highest rates of cardiovascular disease and death, with a checkered history of Black resilience and anti-Black racism. This community-led project reflects one of the few GI projects in the Southeast and the only large-scale trial specific to Black women. Black women experience higher rates of poor sleep, cardiovascular disease, and financial strain than White counterparts.[24–26] Further, at least one study shows that the impact of financial strain on sleep may be increased among Black adults compared to other racial/ethnic groups in the United States.[27] This project demonstrates lower financial strain and mental distress, and longer, higher quality sleep following 12 and 24 months of GI among Black women compared to a comparison group unselected for the GI intervention. While untested in this project, these mechanisms may translate into sustained health benefits for cardiovascular, metabolic, and mental health. Future researchers should consider assessing the impact of GI on other dimensions of health, including blood pressure, metabolic health, and objectively measured sleep. If our results are replicated, this would support GI as a promising intervention to improve population health, adding to the existing evidence on tools to address social determinants of health. Further, health researchers should consider whether health impacts are sustained or if improvements are only present during GI receipt. Of note, other data suggest that improvements in self-rated mental health and physical functioning may present only while currently receiving GI but are not sustained following the intervention.[18]

The results of this study should be considered given its limitations. First, participation in the program was not conditional on completing surveys, and response rates for the 12- and 24-month follow-up surveys were low, particularly among comparison participants. Reassuringly, demographic characteristics of those who participated and did not participate in follow-up were similar (Supplemental Table 1). Second, we

lack objective measures of sleep or other dimensions of health and rely on self-reported measures. We note that the PSQI has been validated across many populations and is considered a validated and reliable measure of sleep quality and duration.[28] Third, many participants did not complete both the 12 and 24-month follow-up surveys, making the mediation analysis underpowered. However, the total effect estimates are similar to those observed in the population of individuals observed at either 12 and/or 24 months. Fourth, we lack baseline measures of the outcomes for participants.

Cardiovascular disease is the leading cause of death among Black women, with sleep and stress as key pathways.[1,29,30] Community-based projects addressing social determinants have enormous potential to improve health across a spectrum of domains. We demonstrate the potential of guaranteed income to improve sleep quality and lower mental distress following 12 and 24 months of program participation. Policymakers should consider GI as an essential tool for health promotion and disease prevention.

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Statements and Declarations

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Ethical Approval

Ethical oversight was maintained with a university IRB exemption obtained in 2022 from the Institutional Review Board of Appalachian State University.

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

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Table 1. Baseline Administrative Characteristics of Sample, In Her Hands Guaranteed Income Pilot, Georgia, 2020-2022

	Total	Comparison	Guaranteed Income Recipients	
	842	374	468	
	% (n) or median (IQR)	**% (n) or median (IQR)**	**% (n) or median (IQR)**	**p[a]**
Self-identified as Black	98.93 (831)	98.11 (365)	99.58 (466)	0.005
Number of government benefits received	2 (1;3)	2 (1;3)	2 (1;3)	0.207
Number of adults	1 (1;2)	1 (1; 2)	1 (1;2)	0.000
Number of children	1 (0;2)	2 (0;3)	1 (0;2)	0.197
Annual household income	11,400 (1,200; 21,840)	12,636 (1,200; 23,000)	10,400 (1,144; 20,800)	0.143
Age	37 (31;45)	37 (30;45)	36 (31;45)	0.5896

Abbreviations: IQR – interquartile range

[a]Calculated using Chi-Square tests for categorical variables and Mann Whitney U tests for continuous variables

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Table 2. Distribution of Sleep duration, sleep quality, mental distress, and financial stress at 12 and 24 months among individuals randomly selected to receive Guaranteed Income and non-selected comparison individuals.

	12 months			**24 months**		
	GI recipients	**Comparison**		**GI recipients**	**Comparison**	
n	255	231		260	175	
	Median (IQR) or %	**Median (IQR) or %**	**p**	**Median (IQR) or %**	**Median (IQR) or %**	**p**
Hours of Sleep (median; IQR)	6 (6;8)	6 (5;8)	0.011	7 (6;8)	6 (5;8)	0.076
PSQI Score (median; IQR)[b]	8 (6;11)	10 (7;12)	0.000	8 (6;10.5)	10 (8;13)	0.000
PSQI score below 7 (%)[b]	30.2	18.61	0.003	27.69	14.86	0.002
Less than 6 hours of sleep (%)	23.05	33.48	0.012	22.98	27.91	0.252
Distress						
K10 Score, total (median; IQR)	18 (13;27)	22 (16;29)	0.000	19 (13;27)	24 (17;31)	0.000
K10 Score, categorized			0.003			0.000
Likely no mental disorder	56.43	39.07		51.41	32.37	
Likely mild mental disorder	13.69	19.53		15.26	20.81	
Likely moderate mental disorder	13.69	16.74		14.86	13.87	
Likely severe mental disorder	16.18	24.65		18.47	32.95	
Financial stressors						
How difficult to pay bills in the past month			0.000			0.000
Very difficult	18.85	48.43		20.73	51.45	
Somewhat difficult	63.52	40.81		60.57	37.57	
Not at all difficult	17.62	10.76		18.7	10.98	

Abbreviations: GI – guaranteed income, IQR – interquartile range, K10 – Kessler Psychological Distress Scale, PSQI – Pittsburgh Sleep Quality Index

[a]Calculated using Chi-Square tests for categorical variables and Mann Whitney U tests for continuous variables

[b]Sleep duration truncated at 99th percentile

[c]Analytic sample limited to those who answered at least one of the PSQI construction variables.

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Table 3. Differences in sleep duration, mental distress, and sleep quality at 12 and 24 months between individuals who received 24 months of Guaranteed Income compared to those who did not, In Her Hands, Georgia, n = 842

	Unadjusted Beta[a] (95% CI)	**Adjusted Beta [a,b] (95% CI)**
Sleep duration, hours	0.24 (-0.14, 0.61)	0.22 (-0.15, 0.60)
Sleep quality (PSQI score)	-1.32 (-1.81, -0.83)	-1.33 (-1.83, -0.82)
Mental distress (K10)	-3.85 (-5.45, -2.52)	-3.99 (-5.45, -2.52)

Abbreviations: CI – confidence interval, GI – guaranteed income, K10 – Kessler Psychological Distress Scale, PSQI – Pittsburgh Sleep Quality Index

[a]Standard errors are clustered at the participant level; sample is limited to complete responses on key variables for both Wave 2 (Year 1) and Wave 4 (Year 2).

[b]Adjusted for site, wave (year), age

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Table 4. Differences in sleep duration, sleep quality, and mental distress comparing individuals selected to receive 24 months of guaranteed income to those not selected and potential mediation by lack of financial hardship,[a] In Her Hands, Georgia

	Sleep duration, hours	**Sleep quality**	**Mental distress**
	235	236	236
	Beta (95% CI)[b]	**Beta (95% CI)[b]**	**Beta (95% CI)[b]**
Total effect	0.25 (-0.53, 1.03)	-1.45 (-2.35, -0.55)	-4.79 (-7.16, -2.42)
Natural indirect effect	-0.01 (-0.09, 0.07)	-0.17 (-0.37, 0.02)	-0.72 (-1.38, -0.05)
Natural direct effect	0.26 (-0.55, 1.06)	-1.28 (-2.18, -0.38)	-4.07 (-6.46, -1.68)
Proportion mediated		0.12 (-0.03, 0.27)	0.15 (0, 0.3)

Abbreviations: CI- confidence interval, K10 – Kessler Psychological Distress Scale, PSQI – Pittsburgh Sleep Quality Index

[a]Lack of financial hardship defined as responding "not at all difficult" to the question "how difficult has it been to pay bills in the past month?"

[b]Adjusted for site, age, income, number of children

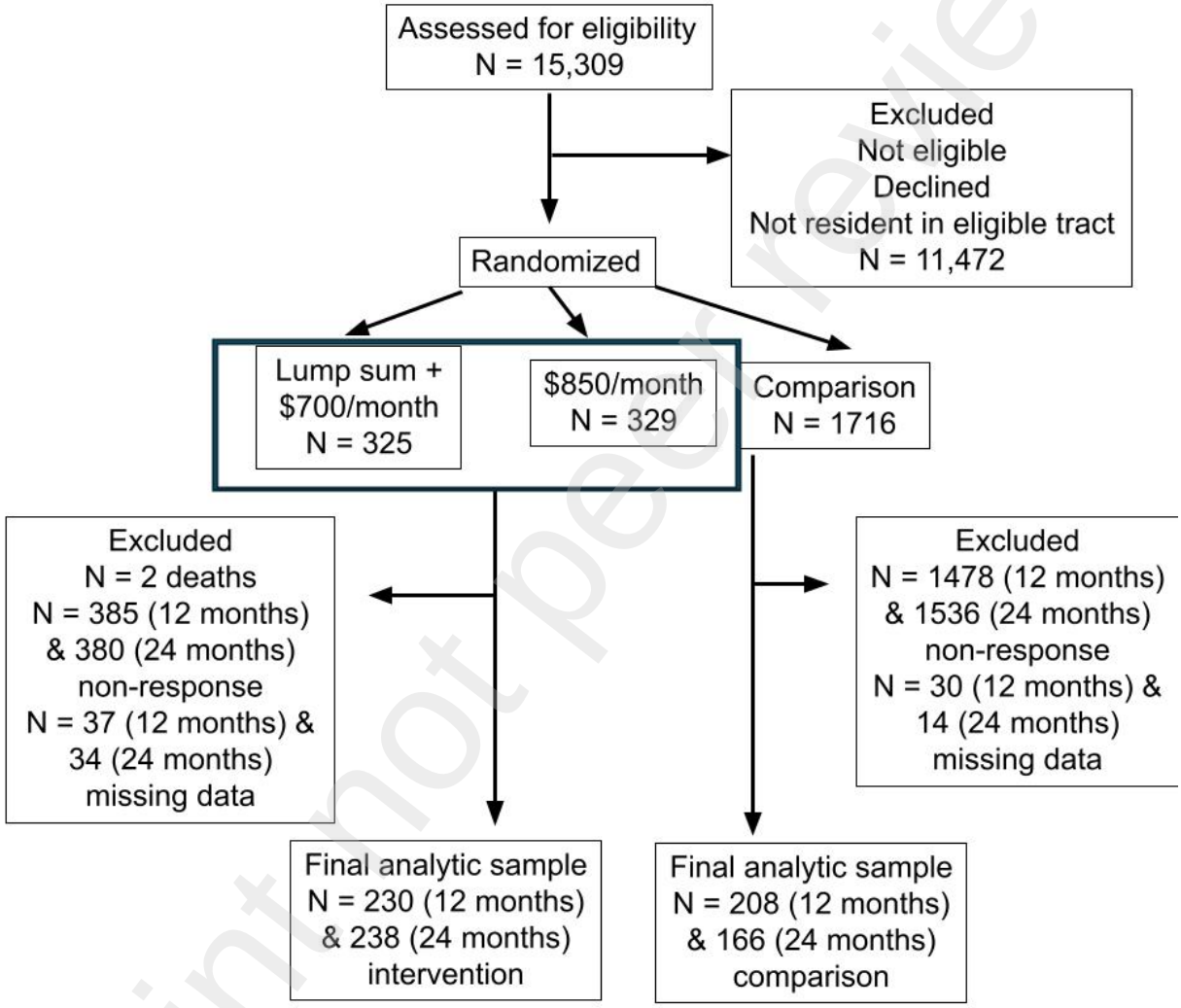

Fig. 1 CONSORT Study flow diagram demonstrating exclusion criteria at each stage, In Her Hands trial, Georgia, 2022-2024