

**Human Recognition among HIV-Infected Adults:
Evidence from a Randomized Controlled Trial in Kenya**

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Abstract: The paper evaluates the impacts that food supplementation and medical treatment have on human recognition among malnourished, HIV-infected adults in Kenya. Human recognition is defined as the extent to which an individual is acknowledged by others to be of inherent value by virtue of being a fellow human being. Questions in a randomized controlled trial were specially designed to measure human recognition, the first time human recognition has been empirically measured. Determinants of human recognition and the role recognition plays in nutritional status and subjective well-being are also examined. Six months of food supplementation is found to have a significant positive impact on recognition levels, and this effect is robust to controlling for changes in health and nutrition that food may cause. Improvements in human recognition are greater in rural and peri-urban areas than in urban areas. Women receive lower levels of human recognition than men and also have worse mental health status; the relationship among gender, mental health, and human recognition merits further investigation. There is some evidence of an association between human recognition and nutritional status and some evidence of human recognition's contribution to well-being, but further study of these relationships is needed.

JEL Codes: O15, I31, I15

Keywords: human recognition, respect, dehumanization, HIV, malnutrition, food supplementation, well-being, stigma, Kenya

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1. Introduction

In recent years, the study and practice of economic development have expanded to focus on intangible underlying factors of development, such as freedom (Sen 1999), empowerment (World Bank 2005), and social capital (Isham, Kelly and Ramaswamy 2002). This paper builds on this work but focuses on a concept distinct from those cited above; the paper measures the extent to which individuals are viewed, valued, and treated as fellow human beings – the concept of “human recognition” – and evaluates the impact of specific health and nutrition program interventions on human recognition.

Human recognition is defined as the extent to which an individual is acknowledged by others to be of inherent value by virtue of being a fellow human being. Human recognition can be positive or negative. Provision of positive human recognition refers to actively acknowledging an individual to be of value by virtue of being a human being who possesses basic qualities in common with oneself and other human beings. Provision of negative human recognition refers to viewing an individual as lacking inherent value as a human being or not acknowledging this value. For more detailed description of the concept of human recognition, see Castleman (2011a). Human recognition transactions occur in multiple domains of individuals’ lives, and measurement of human recognition focuses on the three primary domains of household, community, and institutions.

Human recognition plays multiple roles in development. As modeled in this paper and more extensively in Castleman (2011b), human recognition is hypothesized to affect development outcomes such as health and consumption through impacts on individuals’ behaviors, choices, and access to opportunities and services. Development programs

themselves can influence human recognition transactions. This paper studies two specific program interventions: supplementary food and antiretroviral therapy for HIV. Data from a randomized controlled trial are used to examine the impact these interventions have on the human recognition levels of malnourished, HIV-infected adults in Kenya. Different pathways by which these interventions affect recognition are tested. Determinants of human recognition and the extent to which human recognition is a determinant of nutritional status and well-being are also examined.

Sub-Saharan Africa is home to approximately 23.5 million people living with HIV/AIDS (UNAIDS 2012). HIV-infected individuals are often subject to stigma from their families, communities, and institutions (Brown et al. 2001). HIV-related stigma refers to “all unfavorable attitudes, beliefs, and policies directed toward people perceived to have HIV/AIDS” (U.S. Department of Health and Human Services 2003). Many documented manifestations of stigma are also manifestations of negative human recognition, such as domestic violence or barring infected individuals from participating in household or community activities. Negative human recognition underlies stigma and stigmatizing behaviors; failure to recognize an HIV-infected individual to be of inherent value as a fellow human being facilitates “unfavorable attitudes, beliefs, and policies” and related behaviors. Based on this relationship between human recognition and stigma and given the prevalence of HIV-related stigma in Kenya (see Hamra et al. 2006 for quantification of HIV-related stigma in Kenya), it is expected that some HIV-infected individuals in Kenya receive low levels of human recognition.

Studies of food supplementation among HIV-infected adults have examined outcomes such as malnutrition, treatment adherence, disease progression and other

clinical outcomes (Ndekha et al. 2009a; Ndekha et al. 2009b; Cantrell et al. 2008; Koethe and Heimbürger 2010; and Mahlangu et al. 2007). Receiving food supplementation may also influence human recognition or related outcomes among malnourished HIV-infected clients, but studies have not examined such outcomes. To address gaps in the evidence base about the impact of food supplementation on malnourished, HIV-infected adults, the U.S. Agency for International Development (USAID) funded the Food and Nutrition Technical Assistance (FANTA) Project and the Kenya Medical Research Institute (KEMRI) to carry out a randomized controlled trial of the impacts of supplementary food in 2006-2008. Questions were included to measure human recognition levels among study subjects. This randomized trial is the first time that human recognition has been empirically measured and, in addition to providing empirical evidence about specific research questions, demonstrates how human recognition can be measured in the context of health services or a research study.

The next section presents a model of human recognition in development programs. Section 3 describes the study design, Section 4 describes the variables, and Section 5 presents the empirical strategy. Section 6 reports results, and the final section discusses key findings and limitations.

2. Model of Human Recognition's Role in Utility

A simplification of the full model of human recognition in Castleman (2011b) focuses on the hypotheses tested in this study. An individual's utility function is given by $U = U(h, c, R)$, where h , c , and R are health, consumption, and the total level of recognition received by an individual, respectively. Utility obtained from provision of human recognition to others is not part of the empirical study and is not included in the

function. The utility function is expanded to include sub-utility functions for health and consumption:

$$\begin{aligned}
 U &= u_h[h(H, R)] + u_c[c(C, R) + \phi R] = \eta h(H, R) + \kappa c(C, R) + \phi R \\
 &= \eta\left(H + \frac{HR}{\lambda} + \sigma R\right) + \kappa\left(C + \frac{CR}{\gamma} + \delta R\right) + \phi R
 \end{aligned}$$

where $H, C,$ and $R \geq 0$; $\sigma, \delta > 0$; $\phi > 0$; and $\lambda, \gamma > \max(R)$.

ϕ is a parameter reflecting the psychic utility that one's human recognition level confers (or more broadly, the utility conferred by human recognition through all pathways other than health and consumption). η and κ are parameters reflecting the utility conferred by health and consumption. σ and δ are parameters reflecting recognition's direct effect on health and consumption respectively. H and C are all factors and inputs other than human recognition that determine health status and consumption respectively, e.g. availability of health services, income, age, proximity to health facilities, etc. In this model, $H, C,$ and R are non-negative with zero signifying the worst status.

The $\frac{HR}{\lambda}$ and $\frac{CR}{\gamma}$ terms represent the effects that one's human recognition level has on the "productivity" of other factors in producing health and consumption respectively. The restriction on the parameters λ and γ that they are greater than the maximum level of R means that the effect of these interactions will always be smaller in magnitude than the direct effect that non-recognition factors H and C have on health and consumption.

A number of predictions emerge from the model that are empirically tested using the study data.

$$1) \frac{\partial U}{\partial R} = \eta\left(\frac{H}{\lambda} + \sigma\right) + \kappa\left(\frac{C}{\gamma} + \delta\right) + \phi > 0. \text{ The hypothesis is that an individual's}$$

recognition level has a net positive effect on her total utility.

2) $\phi > 0$. The hypothesis is that an individual's recognition level has a positive psychic effect on his/her utility level in addition to recognition's effect through changes in material outcomes.

$$3) \frac{\partial h}{\partial R} = \frac{H}{\lambda} + \sigma \geq 0. \text{ The hypothesis is that an individual's recognition level is a}$$

determinant of health and that the relationship between the two is positive.

$$4) \frac{\partial R}{\partial H} \geq 0. \text{ The hypothesis is that food and medical treatment have positive}$$

impacts on recognition levels¹.

$$5) \frac{\partial R}{\partial h} \geq 0. \text{ Because the relationship between health and human recognition is}$$

hypothesized to be simultaneous, this partial derivative captures the reverse effect of 3)

above, i.e., that health status is a determinant of recognition levels and that the

relationship is positive.

¹ Because the theoretical model presented here does not include determinants of recognition receipt, this hypothesis – unlike the first three – is not an explicit prediction of the model.

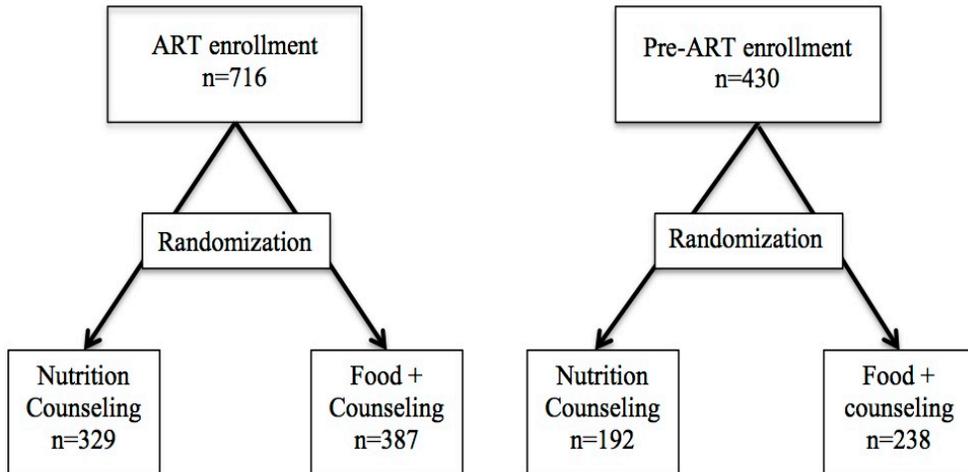
3. Study Design

At six HIV treatment sites in Kenya² eligible subjects were randomized to receive, along with their other treatment services, either a) 12 months of nutrition counseling or b) 12 months of nutrition counseling and 6 months of food supplementation consisting of 300 grams/day of pre-cooked micronutrient-fortified blended flour composed of corn, soy, vegetable oil, sugar, whey protein, and micronutrient premix. This supplement provides approximately 50% of estimated daily energy needs for malnourished, HIV-infected adults. One arm of the study consisted of malnourished, HIV-infected adults who began ART within a month of recruitment. The other arm consisted of malnourished or nutritionally vulnerable HIV-infected adults who were not yet eligible for ART because their disease was at an earlier stage but who were prescribed antibiotics (cotrimoxazole) per the standard of care to prevent opportunistic infections. Subjects in both arms were randomized between food and non-food groups. Figure 1 diagrams the study design³.

² The six sites were: Maragwa District Hospital, Mathere North Hospital, Mbagathi District Hospital, Naivasha District Hospital, Nyeri Provincial Hospital, and Riruta City Council Hospital.

³ The main reason the number of clients receiving food is higher than the number not receiving food is that some clients chose to drop out of the study after learning which group they were randomized to, and more of those assigned to receive no food dropped out than those assigned to receive food.

Figure 1: Design of Randomized Controlled Trial



Eligibility for the study was determined by nutritional status using body mass index (BMI) cutoffs established by WHO (1999). ART subjects had BMIs between 14-18.5 kg/m² at the time of enrollment. Pre-ART subjects had BMIs between 14-18.5 kg/m², or 18.5-20 kg/m² with weight loss during the past month⁴. Women who reported being pregnant or lactating were excluded from analysis. For ethical reasons, all patients with BMI < 14 kg/m² were provided food. Their data were excluded from analysis. At the time of the study the standard of care for malnourished HIV-infected individuals in Kenya did not include food supplementation. Programs were providing food supplementation at some facilities, but the study was conducted only at sites where food was not already being provided. Therefore, introduction of the study did not prevent any clients from receiving food supplementation who would otherwise have received it. The study protocol was approved by institutional review boards in the U.S. and in Kenya.

A total of 1,146 subjects were enrolled. Complete data are available for fewer

⁴ Pre-ART clients may be more vulnerable since their HIV is not being treated yet, and there may be benefits of supporting such clients who have declining nutritional status before they cross the threshold into malnutrition.

subjects due to high attrition rates and missing data. Attrition among ART clients was a significant problem in Kenya, and post-election violence that occurred in Kenya during January and February 2008 caused missed appointments and staff shortages, leading to missing data. Two sources of attrition, unreported mortality and inability to return to the clinic due to illness or poverty, are more likely among those who enter the study with poorer health. This is likely why baseline CD4 count is significantly higher among subjects for whom there are data at 9 or 12 months than it is for all subjects (211 vs. 186, $p < .05$). Therefore, results from these periods reflect a sample that was somewhat healthier at baseline than the full set of subjects.

For some clients recruited late in the study period, data were collected for less than 12 months. Recruitment took longer than expected due to decentralization of HIV treatment services in Kenya and other factors. Funding for the study required that data collection end in June 2008, and data from clients who had not reached 12 months by then are used in analyses at earlier months but not in the 12-month analysis. The only factor determining this exclusion was the date of recruitment, and this does not appear to bias the 12-month data, though it does reduce the sample size for the 12-month analysis.

4. Variables

Human Recognition Variables

Seven questions in the trial were specially designed to measure the level of human recognition received by subjects. These variables are listed in Table 1. Self-reported responses use a 4-point scale. Although self-reported receipt of recognition is being measured directly, data on respect and how one's problems are viewed by others are also collected because the concept of human recognition was new to both subjects and data

collectors in this study, and questions about related, familiar concepts such as respect capture aspects of human recognition that subjects might not consider in responding to the human recognition question. Whether subjects eat meals with other household members serves as an objective measure of the human recognition that family members provide to subjects. In Kenya and elsewhere, cases have been reported of people refusing to eat meals with HIV-infected individuals, denying them participation in a basic and communal part of household life (Mishra et al. 2009, Kako and Dubrosky 2013).

Table 1: Variables Measuring Human Recognition Receipt

Domains	Variables
<i>Household</i>	Self-reported assessment of how much one is recognized and valued as a human being by one's family members
	Self-reported level of respect received from family members
	Self-reported assessment of how family members view the individual's problems and needs
	Whether eat together with other family members at least once per day
<i>Community and Organizations & Institutions</i>	Self-reported assessment of how much one is recognized and valued as a human being by employer, neighbors, and other non-family members
	Self-reported level of respect received from employer, neighbors, and other non-family members
	Self-reported assessment of how employer, neighbors, and other non-family members view the individual's problems and needs

Human recognition is measured in the domains of household, the community and institutions. Because data were collected by health care providers at health facilities, a primary institutional source of human recognition for HIV-infected adults, the questions combined the community and institutions domain to avoid biases from respondents or data collectors. Factor analyses were run with data at baseline and each month for household recognition and for community/institution recognition. Details of the factor analyses are in the Appendix. To generate an overall measure of an individual's human

recognition level, scores from the factor analysis for each domain are weighted and summed to form an index:

$$R_i = \omega_{ho} r_i^{ho} + \omega_{c/in} r_i^{c/in}$$

The subscripts and superscripts signify the domains of household, community, and institutions. The ω s are weights reflecting the relative impact the domains have on one's overall level of recognition.

Based on the number and type of indicators and the aim of balancing household-level and external human recognition, equal weights of 0.5 are assigned to the household domain and to the combined community and institutions domains. As a robustness check, when other weights are used, such as 0.6 and 0.4, regression results do not differ significantly. Empirical models are also estimated using a composite variable of only the self-reported levels of recognition received (not respect or views of problems), equally weighted between household and community/institutions, in place of the full factor score. Regression results using this “direct” measure are similar to results using the factor scores. Models were also estimated using a measure of “minimum recognition”, the lowest level of recognition reported from the six self-reported questions, with similar results.

Other Variables

Table 2 presents baseline statistics. The high female-to-male ratio among clients is consistent with HIV treatment patterns in Kenya at the time: HIV prevalence was higher among women than men, 8.7 % and 4.6% respectively (Central Bureau of Statistics Kenya 2004), and women were also more likely to seek treatment (Voeten et al. 2004). Medical treatment is measured with a value of 2 assigned to those taking ART, 1

to those taking cotrimoxazole but not ART, and 0 at baseline before medication began. At the time of the study, WHO recommended beginning ART when CD4 counts drop below 200 cells/ μ l. (In 2009, WHO revised its guidelines, recommending initiation of ART when CD4 counts drop below 350 cells/ μ l.). The physical and mental health variables use self-reported responses to standard questions developed by the U.S. Centers for Disease Control and Prevention (CDC) to measure quality of life. The physical health variable sums the numbers of poor physical health days and days in pain, so values can range from 0 to 60. The mental health variable uses factor analysis to combine information about numbers of days experiencing stress, depression, sadness, emotional problems, worry, tension, and anxiety. Both physical and mental health variables are coded so higher values represent better health.

Subjective well-being is measured by responses to the question, “Overall, how satisfied are you with your life these days?” Higher values signify greater well-being. Diener and Biswas-Diener (2005) raise the possibility of simultaneity between subjective well-being and psychological empowerment. Similar simultaneity may exist between subjective well-being and human recognition, and endogeneity is tested and addressed in the empirical models.

Table 2: Baseline Statistics

Variable	Baseline Status
Age	35.3 years (mean)
Sex	57% female 43% male
Body mass index	17.6 kg/m ² (mean)
CD4 counts	186 cells/ μ l (mean) 126 cells/ μ l (ART clients' mean) 285 cells/ μ l (pre-ART clients' mean)
Income (monthly)	24% < 1,000 Ksh 22% 1,000 – 2,999 Ksh 19% 3,000 – 4,999 Ksh 23% 5,000 – 9,999 Ksh 9% 10,000 – 19,999 Ksh 2% 20,000 – 49,999 Ksh 0.1% \geq 50,000 Ksh
Distance to health facilities	43% < 5 km 14% 5-10 km 9% 10-15 km 6% 15 – 20 km 28% > 20 km
Education	5% no education 8% 1-4 years 52% 5-8 years 7% 9-12 years 26% 13-14 years 3% > 14 years
Physical health (days of poor health last month + days of pain last month)	19 days (mean)
Mental health	2.09e-9 (mean, from factor analysis)
Human recognition	-.001 (mean, from factor analysis)
Subjective well-being	5% very unsatisfied 33% unsatisfied 57% satisfied 5% very satisfied

5. Empirical Strategy

Empirical Specifications

To test the predictions generated from the theoretical model, three sets of empirical models are estimated. The first set uses human recognition as the dependent variable to test whether provision of supplementary food and whether medical treatment for HIV improve the levels of recognition ($\frac{\partial R}{\partial H} \geq 0$). These models also examine the determinants of human recognition, including the extent to which health status is an independent predictor of human recognition ($\frac{\partial R}{\partial h} \geq 0$). The second set of models uses nutritional status as the dependent variable to test the extent to which receipt of human recognition is a determinant of nutritional status ($\frac{\partial h}{\partial R} \geq 0$). The third set uses subjective well-being as the dependent variable to test human recognition's association with utility ($\frac{\partial U}{\partial R} > 0$) and whether recognition's contribution to utility occurs through changes in physical and mental health and/or through psychic utility ($\phi > 0$).

Three different types of empirical specifications are estimated: baseline models, semi-differenced models, and panel models. *Baseline models* examine variations in baseline status among study subjects. *Semi-differenced models* estimate the differences between the status at a given point of time (3, 6, 9, or 12 months) and the status at baseline. Not all variables are differenced so time invariant variables such as food supplementation, age, sex, and education can be included. *Panel models* exploit all the data points and are estimated as full panels with fixed effects. Because these models use the difference between a variable's value in a given month and its mean for each subject,

time invariant variables cannot be included. Random effects are not rejected in the nutritional status model and are used in that model.

Prior to estimating the multivariate models, t tests for comparisons of means are used to examine differences in human recognition between treatment groups, between men and women, and between subjects at urban and non-urban sites.

Human Recognition Models

The model for determinants of human recognition at baseline is:

$$R_{i0} = \alpha + \beta \mathbf{d}_i + \gamma \mathbf{h}_{i0} + e_i$$

where \mathbf{d}_i is a vector of time-invariant characteristics, and \mathbf{h}_{i0} is a vector of time-variant characteristics at baseline.

The model used to test the effects of food and medical treatment on human recognition is:

$$\Delta R_{i6,0} = \alpha + \delta f_i + \beta \mathbf{d}_i + \gamma \Delta \mathbf{h}_{i6,0} + e_i$$

where the \mathbf{h} variables measure the difference between 6 months and baseline, and f_i is a dummy variable for whether the subject received food or not. These models are also run at 3, 9, and 12 months. In order to isolate any direct effects food and medical treatment have on human recognition, health and nutritional status are controlled for in some models.

The human recognition model using full panel data to examine the determinants of changes in human recognition is:

$$R_{it} = \alpha + \beta \mathbf{h}_{it} + e_{it}$$

where \mathbf{h}_{it} is a vector of time-variant characteristics.

Nutritional Status Model

The nutritional status model uses full panel data:

$$N_{it} = \alpha + \varphi R_{it} + \beta h_{it} + e_{it}$$

Variations and robustness checks use direct measurement of recognition in place of factor scores and change some of the control variables. Unlike the recognition panel, Hausman specification tests do not reject random effects, meaning the individual-specific variables not included in the model are not correlated with the explanatory variables. Random effects estimation is used in addition to fixed effects.

Subjective Well-Being Models

The baseline model for subjective well-being is:

$$SWB_{i0} = \alpha + \varphi R_{i0} + \beta d_i + \gamma h_{i0} + e_i$$

In specifications that do not include baseline health status in h_{i0} the full relationship between recognition and subjective well-being is captured in φ . When physical and mental health and nutritional status are included, φ measures human recognition's direct psychic effects on well-being. The use of ordered probit to estimate models in which subjective well-being is the dependent variable follows Frey and Stutzer (2005) and Kingdon and Knight (2007).

The semi-differenced subjective well-being model is:

$$\Delta SWB_{i6,0} = \alpha + \varphi R_{i6,0} + \delta f_i + \beta d_i + \gamma \Delta h_{i6,0} + e_i$$

The full panel data model is:

$$SWB_{it} = \alpha + \varphi R_{it} + \beta h_{it} + e_{it}$$

Probit estimation cannot be used with fixed effect panel data⁵, and Stata does not support

⁵ Fixed effects cannot be conditioned out of the likelihood function for a probit, and unconditional fixed

ordered logit estimation with fixed effects for panel data. Therefore, the model is estimated as a linear model.

Identification

Initially OLS is used for continuous variables, ordered probit for discrete variables, and generalized least squares for the random effects models. Since the food intervention is randomized, that variable is exogenous in all models. However, tests indicate that some other explanatory variables are endogenous in the human recognition and subjective well-being models, including *recognition, physical health, mental health, nutritional status*⁶. In the semi-differenced models the effects of individual-specific, omitted variables that influence the dependent and independent variable levels are subtracted out by the differencing. However, if there are omitted variables that affect changes in the levels of both dependent and independent variables over the period of measurement, then endogeneity could bias the OLS estimators. For example, in the human recognition models, omitted characteristics of the subject's family, social networks, or social capital may influence the extent to which improvements in human recognition occur as well as influencing changes in mental health and possibly physical health. There could also be simultaneity between changes in the independent variables and the dependent variables. In the panel models, individual-specific omitted variables are subtracted out in the fixed effects, and the primary possible source of endogeneity would be simultaneity between deviations from the means of dependent and independent variables.

effects probit models are biased (Stata 2007).

⁶ Hausman specification tests do not reject exogeneity for any of the nutrition panel models.

Leading values of variables are used as instrumental variables⁷. Lagged values are not used, except in the 12-month specification, so baseline values can be included to capture changes during the initial months of interventions. Leading values are correlated with the endogenous variables, e.g. *mental_health*_{i6} is correlated with *mental_health*_{i0}, but leading values are not expected to be correlated with the error term in the original model. There is not simultaneity across different time periods because, for example, mental health in a future month will not influence human recognition in an earlier month. To the extent that leading values of mental health status are correlated with earlier values of recognition, it is through the correlation between mental health status at baseline and month 6, which is the correlation the instrument is designed to use. Evidence supporting validity of the instruments is found in the Hansen J test statistics that indicate exogeneity of the instruments and the Anderson canonical correlation likelihood ratio statistics that indicate the instruments are correlated with the endogenous variables. One challenge posed by using leading values as instruments is it reduces the number of observations because some subjects are missing some data.

⁷ Stata does not have commands for using instrumental variables with ordered probits. Therefore, for ordered probit specifications where endogeneity of independent variables is indicated, two stage least squares is performed manually, following Bartilow (2008).

6. Results

Baseline Equivalence

Table 3 demonstrates baseline equivalence between the food and no-food groups in the three outcome variables.

Table 3: Baseline Equivalence in Outcome Variables

<i>Variable</i>	<i>Mean among food group</i>	<i>Mean among no-food group</i>	<i>p-value</i>
Human recognition at baseline	-0.022	0.025	.43
BMI at baseline	17.67	17.64	.68
Subjective well-being at baseline	1.65	1.60	.256

Impact of Food and Medical Treatment on Human Recognition and the Determinants of Human Recognition

Comparison of means

Table 4 reports the results of t-tests comparing the mean values of variables between intervention groups. The equivalence in human recognition levels at baseline between the food and no-food groups is expected because the food intervention was randomized. After 6 months of interventions, the increase in recognition is higher ($p = .07$) among those receiving food by approximately one third of a standard deviation. At 12 months, after an additional 6 months of no food interventions to either group, the difference between the two groups is no longer significant. This indicates that food supplementation improves human recognition among this population group during the period of supplementation but that the effect does not persist following completion of supplementation.

Table 4: Comparison of Means t-Tests by Intervention

<i>Intervention</i>	<i>Variable</i>	<i>Mean with intervention</i>	<i>Mean without intervention</i>	<i>p-value</i>
<i>Food</i>	CD4 count at baseline	184.9	187.7	.40
	Human recognition at baseline	-0.022	0.025	.43
	Change in human recognition at 6 months	<i>0.057</i>	<i>-0.186</i>	<i>.07</i>
	Change in human recognition at 12 months	-0.012	0.129	.35
<i>ART</i>	CD4 count at baseline	126.4	284.8	< .001
	Human recognition at baseline	-0.053	0.072	.02
	Change in human recognition at 6 months	0.020	-0.084	.22
	Change in human recognition at 12 months	0.021	0.073	.37

In all tables, bold values indicate significance at the .05 level. Bold italics values indicate significance at the .1 level.

A t-test finds that at baseline the group beginning ART had significantly lower mean human recognition levels than the group that was not yet eligible for ART ($p=.02$). Unlike food, ART was not randomized; per WHO guidelines, the subjects starting ART were those whose disease was more progressed. This finding suggests that clients with more advanced disease receive lower levels of recognition, possibly because the effects of the disease are more visible, HIV status is more likely known by others, individuals are less productive in performing tasks, and they require greater care. Starting ART itself may also entail disclosure of HIV status for the first time, leading to stigma and negative human recognition. During the period of the study, changes in recognition are not significantly different between those taking ART and those not taking ART.

Women received significantly lower levels of recognition at baseline than men (Table 5). Women also experienced greater improvements in human recognition during and after the interventions; this difference was not statistically significant at completion

of the food intervention ($p=.21$) but was marginally significant at 12 months ($p=.056$). Men had lower CD4 counts than women at baseline, which is likely because men often seek treatment for HIV later in the disease progression than women do (Voeten et al. 2004).

Table 5: Comparison of Means t-Tests by Sex

<i>Variable</i>	<i>Mean among Women</i>	<i>Mean among Men</i>	<i>p-value</i>
CD4 count at baseline	196.2	173.0	.02
Human recognition at baseline	-0.118	0.151	<.001
Change in human recognition at 6 months	0.012	-0.096	.21
Change in human recognition at 12 months	0.145	-0.094	.056

Table 6 reports results of the human recognition models. The first two baseline models use OLS and ordered probit for human recognition factor scores and direct measures respectively, with very similar results. Sex is a significant determinant of human recognition at baseline, with women more likely to receive low levels of recognition than men. Physical and mental health are also both significant determinants of human recognition levels with less healthy subjects more likely to receive lower levels of recognition. Subjects with higher incomes are more likely to receive higher levels of recognition.

Table 6: Results from Human Recognition Models

	Baseline Models			Semi-Differenced Models			Panel Models	
	(1)	(2)	(3)	(4)	(5)	(5)	(7)	(8)
Dependent variable	Human recognition (HR)	HR (direct)	HR (direct)	Δ HR to 6 months	Δ HR to 6 months	Δ HR to 6 months	HR	HR
Estimation method	OLS	Ordered Probit	Ordered Probit with IV	OLS	OLS	2SLS	Fixed Effects w/OLS	Fixed Effects w/2SLS
Constant	-0.297 (0.520)	--	--	0.769 (0.559)	1.24 (0.647)	1.94 (1.56)	-0.596 (0.208)	-2.37 (1.00)
Age	0.002 (0.004)	-0.002 (0.008)	-0.016 (0.013)	-0.001 (0.008)	-0.008 (0.009)	-0.016 (0.018)	--	--
Sex	-0.233 (0.058)	-0.462 (0.137)	0.034 (0.267)	0.152 (0.138)	0.105 (0.151)	0.283 (0.239)	--	--
Education	-0.003 (0.029)	-0.016 (0.059)	0.005 (0.096)	-0.065 (0.068)	-0.107 (0.074)	-0.239 (0.135)	--	--
Distance to facility	-0.004 (0.022)	-0.005 (0.041)	-0.019 (0.065)	-3e-4 (0.045)	0.016 (0.047)	0.020 (0.098)	--	--
Site	0.006 (0.024)	-0.053 (0.042)	0.144 (0.118)	-0.243 (0.055)	-0.245 (0.062)	-0.246 (0.148)	--	--
Income	0.045 (0.028)	0.084 (0.056)	0.066 (0.104)	-.012* (0.045)	-0.009* (0.052)	0.026* (0.123)	--	--
CD4	-7e-5 (2e-4)	4e-4 (4e-4)	-3e-4 (8e-4)	--	--	--	--	--
Physical health	0.004 (0.002)	0.0074 (0.0035)	-0.073 (0.037)	--	-0.002* (0.003)	-0.011* (0.033)	0.0024 (0.0012)	0.001 (0.004)
Mental health	0.082 (0.045)	0.117 (0.067)	2.53 (0.929)	--	-0.011* (0.060)	0.235* (0.237)	0.036 (0.018)	-0.174 (0.174)
BMI	0.009 (0.027)	0.061 (0.050)	0.219 (0.121)	--	-0.042* (0.033)	-0.031* (0.115)	0.030 (0.012)	0.133 (0.059)
Medical Treatment	--	--	--	-0.002 (0.140)	0.027 (0.157)	-0.113 (0.291)	-0.0363 (0.026)	-0.115 (0.054)
Food	--	--	--	0.305 (0.137)	0.264 (0.163)	0.557 (0.263)	--	--
n	485	485	212	141	113	54	2,688	981
Prob>F, χ^2	.004	.0001	.01	.0002	.0025	.02	.0004	.016
Instruments	--	--	Physical, mental health, nutrition (1)	--	--	Physical, mental health (12), nutrition (7)	--	Leading mental health, leading nutrition

Heteroskedasticity-robust standard errors are given in parentheses.

* change in variable from baseline to 6 months

Determinants of human recognition at baseline

In the IV estimation results, the number of observations declines from 485 to 212 because of missing data for leading variables. The coefficient on *mental health* has a large positive magnitude and is highly significant: those with better mental health receive higher levels of recognition. The *nutritional status* coefficient becomes marginally significant, indicating that subjects with worse nutritional status also receive lower levels of recognition. The coefficient on *physical health* remains significant but is now negative, indicating those with worse physical health in the past 30 days receive higher levels of recognition. This is a surprising result but could be due to the additional care provided to ill subjects.

Interestingly, the coefficient on *sex* is no longer significant. This suggests that when physical and mental health and nutritional status are fully controlled for and endogeneity addressed, being female does not significantly affect the level of human recognition received. When only *nutritional status* and *physical health* are treated as endogenous and instruments are used, but not *mental health*, *sex* remains significant and positive (results not shown)⁸. But when *mental health* is treated as endogenous and instrumented, even when both *physical health* and *nutritional status* are treated as exogenous, the coefficient on *sex* is insignificant. In the linear regression the t-statistic for the *sex* coefficient drops from over 2 to 0.07 by instrumenting for mental health. This suggests that while women in the study receive significantly lower levels of human recognition, women and men with the same mental health status do not differ in recognition. A comparison of means shows that women have worse mental health status than men ($p=.09$), and in a linear regression *sex* is a significant independent predictor of mental health status ($p=.05$).

⁸ Here and throughout the paper, results that are not shown are available with the author.

Impacts of food and treatment on changes in human recognition

Since the food intervention is randomized, the comparison of means demonstrates food's impact on human recognition. However, multivariate regressions are also carried out as a robustness check and to examine other determinants of changes in human recognition. The coefficient on *food* is positive and significant in all three semi-differenced models, indicating that subjects who received food supplementation had significantly greater improvements in human recognition than those who did not receive it, controlling for various demographic, socio-economic and health variables. With factor scores, interpreting magnitudes is challenging, but in the first model (4), addition of food supplementation increases the improvement in an individual's human recognition over 6 months by an average of about one third of a standard deviation of the change in recognition and 40% of a standard deviation of baseline recognition, compared to those not receiving supplementation. The coefficient on *food* in (4) captures all the effects that food supplementation has on changes in human recognition levels, including through improved health and nutritional status and through greater value and recognition received from other household members by bringing home significant quantities of food⁹.

The coefficient on *medical treatment* is not significant, suggesting that treatment with ART for those requiring it does not confer significantly greater or lesser human recognition benefits than treatment with cotrimoxazole prophylaxis for those not yet requiring ART.

The *site* variable is coded such that higher values signify the three sites located in

⁹ The food was for the subjects themselves but qualitative assessments indicated it was sometimes shared with others, and food consumed by the subjects still served as an income transfer to the household. Valuing someone for the material goods she brings home is distinct from valuing her for her inherent worth as a human being, but increases in the former may enhance or help actualize the latter.

urban slums in Nairobi and lower values signify the three sites at the three district and provincial hospital sites in rural or peri-urban areas. The coefficient on *site* is negative and significant in all three semi-differenced models; subjects at the non-urban sites accrued greater human recognition gains than those in the urban clinics. Given that *site* was not a significant determinant of human recognition in the baseline model and there was baseline equivalence in human recognition across sites, this result suggests there were systematic differences across sites or in factors that facilitate the interventions' impact on human recognition. This could occur through counseling methods, staff's interpersonal approaches, or facility systems, or through other factors in the environment outside the health facilities. When a *siteXfood* interaction term is added, its coefficient is not significant (results not shown), suggesting that the result is not explained by greater food insecurity in rural areas generating greater recognition from bringing home food. The baseline equivalence and the robustness of the result to coding *site* as a binary, urban-rural variable or as different values for each site, differences in data collection across sites do not seem to explain this result either.

Model (4) is run at 9 and 12 months to examine whether the results persist after completion of the food interventions (not shown). At 9 months the coefficient on *site* is still significant and negative, and the coefficient on *food* is still positive but no longer significant ($p=.16$). By 12 months *site* is still significant and negative, but *food* is no longer significant.

Models (5) and (6) control for changes in nutrition and physical and mental health so the coefficient on *food* captures the effects that food has on recognition through enhanced status within the household or other factors unrelated to changes in health or

nutritional status¹⁰. The coefficient on *food* is still positive and significant in these models, suggesting that part of how food supplementation impacts human recognition is through channels other than one's health and nutrition status. In the IV model receipt of food increases human recognition levels by 0.56 units, which is 59% of a standard deviation of the change in human recognition, and 72% of a standard deviation of the baseline level of human recognition. When change in CD4 count is included, the coefficients on *food* remain significant in both the OLS and IV model, but the overall IV model is no longer significant (results not shown).

Determinants of changes in human recognition

OLS estimation results for the full panel with fixed effects finds that increases in BMI, reductions in physically unhealthy days, and reductions in mentally unhealthy days are all significant predictors of increases in human recognition received. Using two-stage least squares, the coefficient on *nutritional status* remains significant and positive and the coefficient on *treatment* is negative and significant, but the coefficients on the two health variables are not significant. The significant negative coefficient on treatment means that when clients reached the stage of requiring ART, they were receiving lower levels of recognition relative to their average recognition level than when clients were at the stage of only requiring cotrimoxazole. This is consistent with the earlier finding of lower mean values of human recognition among ART clients than pre-ART clients.

Role of Human Recognition in Nutritional Status

Table 7 reports results from the nutrition panel models. Results of the fixed effects and random effects estimations are quite similar. In models (1) and (2), fewer days

¹⁰ Since the variables used to measure changes in health and nutritional status may omit aspects of health or nutrition (e.g. micronutrient status), the coefficient on *food* could also reflect food's effect on recognition through changes in unmeasured aspects of health and nutrition.

of poor physical health, improvements in human recognition, and taking ART are all significant independent predictors of improved nutritional status. When income and CD4 counts are included in the model, the number of observations decreases because these data are collected less frequently and data are missing for some observations. In these models the coefficients on human recognition remain positive and increase in magnitude but are no longer statistically significant. This may be because CD4 and income are controlled for or may be due to the reduction in sample size. Coefficients on physical health and treatment remain significant. Larger increases in income or in CD4 counts are also predictors of larger increases in BMI.

Table 7: Results from Nutrition Models

Panel Models				
	(5)	(6)	(7)	(8)
Dependent variable	BMI	BMI	BMI	BMI
Estimation method	Fixed Effects w/OLS	Random effects w/GLS	Fixed Effects w/OLS	Random effects w/GLS
Constant	17.01 (0.1335)	16.93 (0.1104)	14.45 (1.115)	15.48 (0.565)
Income	--	--	0.236 (0.095)	0.164 (0.0417)
CD4	--	--	0.0015 (0.0009)	0.0019 (0.0003)
Physical health	0.0178 (0.0028)	0.0196 (0.0021)	0.0192 (0.0073)	0.0126 (0.0035)
Mental health	0.0341 (0.0338)	0.0330 (0.0330)	0.070 (0.148)	-0.0285 (0.0637)
Human recognition	0.123 (0.0452)	0.136 (0.0428)	0.380 (0.267)	0.225 (0.146)
Medical Treatment	0.7947 (0.0517)	0.7300 (0.0427)	1.175 (0.126)	1.177 (0.078)
n	2,688	2,688	831	831
Prob>F, χ^2	<.0001	<.0001	<.0001	<.0001

Role of Human Recognition in Well-Being

Determinants of subjective well-being at baseline

Table 8 reports results from the subjective well-being models. In the ordered probit baseline model (1), the coefficient on *human recognition* is positive and significant, indicating that subjects with higher levels of human recognition at baseline are more likely to have higher levels of subjective well-being at baseline. The coefficient on *recognition* captures associations between human recognition and subjective well-being through both direct psychic effects and health, nutrition and other material outcomes. Controlling for health and nutrition status in model (3), the coefficient on human recognition remains positive and significant at the 0.1 level, though the magnitude and statistical significance decrease. This can be interpreted to mean that one way human recognition affects subjective well-being is through health and nutritional status, so when this pathway is no longer included in the *recognition* coefficient, the magnitude and significance decrease. However, the fact that the coefficient is still negative and significant suggests that human recognition makes other, direct contributions to well-being. The coefficient on *site* is negative and significant; subjects at the sites outside of Nairobi have higher subjective well-being at baseline than those in the Nairobi slum sites.

However, when endogeneity is addressed using instrumental variables¹¹, the sample size drops, the coefficient on *human recognition* is no longer significant, and *site* is the only significant independent predictor of subjective well-being status at baseline.

¹¹ While Hansen J test statistics cannot be generated using ordered probit, the instruments are tested by estimating the model as a linear model and checking the test statistics. The Hansen J test statistic is insignificant (χ^2 p=.6136), providing evidence that the instruments are exogenous. The Anderson canonical correlation likelihood ratio statistic is significant (χ^2 p=.0002) indicating that the instruments are correlated with the endogenous variables.

Table 8: Results from Subjective Well-Being Models

	Baseline Models				Semi-Differenced Models			Panel
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	SWB	SWB	SWB	SWB	Δ SWB to 3 months	Δ SWB to 3 months	Δ SWB to 3 months	SWB
Estimation method	Ordered Probit	Ordered Probit with IV	Ordered Probit	Ordered Probit with IV	Ordered Probit	Ordered Probit	Ordered Probit with IV	Fixed Effects w/OLS
Constant	--	--	--	--	--	--	--	1.87 (0.397)
Age	0.0037 (0.006)	-0.009 (0.009)	0.011 (0.006)	-0.014 (0.011)	-0.016 (0.009)	-0.032 (0.012)	0.005 (0.053)	--
Sex	0.267 (0.112)	0.065 (0.174)	0.232 (0.121)	0.466 (0.382)	-0.254 (0.170)	-0.528 (0.215)	0.234 (0.590)	--
Education	-0.0237 (0.0435)	0.020 (0.060)	-0.006 (0.045)	-0.002 (0.088)	0.030 (0.065)	0.024 (0.087)	0.598 (0.511)	--
Distance facility	-0.046 (0.030)	0.029 (0.047)	-0.027 (0.032)	-0.064 (0.108)	-0.011 (0.049)	-0.065 (0.060)	0.142 (0.211)	--
Site	-0.210 (0.034)	-0.183 (0.049)	-0.205 (0.035)	-0.189 (0.060)	0.109 (0.055)	0.106 (0.071)	0.009 (0.106)	--
Income	0.044 (0.037)	-0.025 (0.490)	0.008 (0.039)	-0.009 (0.056)	**	**	**	0.071 (0.029)
CD4	--	--	0.0006 (0.0003)	-0.0003 (0.0006)	--	0.001* (0.0005)	6.3e-6* (0.001)	-0.0001 (0.0003)
Physical health	--	--	0.002 (0.003)	-0.049 (0.054)	--	-0.005* (0.005)	0.008* (0.213)	0.003 (0.002)
Mental health	--	--	0.260 (0.060)	1.972 (1.329)	--	0.067* (0.092)	2.826* (2.180)	0.067 (0.043)
BMI	--	--	0.120 (0.042)	0.229 (0.181)	--	0.093* (0.066)	-0.120* (0.132)	0.031 (0.023)
Human recog.	0.1977 (0.074)	0.040 (0.191)	0.118 (0.071)	-0.692 (0.431)	0.202* (0.086)	0.234* (0.116)	0.892* (2.490)	-0.060 (0.061)
Medical Treat.	--	--	--	--	0.273 (0.147)	0.338 (0.194)	-0.531 (1.132)	0.091 (0.051)
Food	--	--	--	--	0.059 (0.154)	0.057 (0.209)	0.065 (1.343)	--
n	500	261	480	209	205	122	82	821
Prob>F, χ^2	<.0001	.003	<.0001	.0007	.0006	.0016	.64	<.003
Instruments	--	Human recognition (1)	--	Human recog., mental, physical health, BMI (1)	--	--	Human recog., mental, physical health, BMI (6)	--

* change in variable from baseline to 6 months

** Income was only collected at 0, 6, and 12 months.

Role of human recognition in changes in subjective well-being

The semi-differenced models (5), (6), and (7) follow a similar pattern as the baseline models. Ordered probit estimates yield significant positive coefficients on $\Delta\text{recognition}$ at 3 months both with and without health and nutrition controls. At 6 months these coefficients are no longer statistically significant at the .1 level (results not shown). Hausman specification tests do not reject exogeneity in model (5) but indicate endogeneity in model (6) when health and nutrition controls are included. When leading variables are used as instruments, the coefficient on $\Delta\text{recognition}$ is no longer significant. $\Delta\text{mentalhealth}$ is the only significant variable, and the model does not have significant explanatory power. In the panel model recognition is not significant. When leading values are used as instruments for potentially endogenous variables, the model does not have significant explanatory power (results not shown).

7. Discussion

This study is the first time human recognition has been empirically measured, demonstrating how the concept can be feasibly measured in a research study or health services program. Food supplementation improves receipt of human recognition among malnourished, HIV-infected adults in Kenya. This effect is significant at completion of 6 months of food supplementation, but does not persist 6 months after completion of the food intervention. The finding from the comparison of means is robust to multivariate analysis using various combinations of control variables. The food intervention is randomized, and this result is the most robust finding from the study. The smaller number of observations at 9 months and 12 months reduces the statistical power of results for the later data points.

The effect food supplementation has on human recognition may occur through changes in health and nutrition, or through other changes that affect how subjects are valued by others. These latter effects are isolated to some extent by controlling for physical and mental health, income, and nutritional status, and the food intervention's positive effect on changes in human recognition remains significant, even though the sample size becomes small for these models. This suggests that food supplementation's effect on human recognition occurs at least in part through pathways other than changes in material outcomes that in turn affect human recognition levels.

While the food intervention significantly improved human recognition levels, introduction of ART did not. In addition to the different nature of the two interventions, ART was provided based on stage of disease while food was randomized. Comparison of means tests found that clients eligible for ART began the study with significantly lower human recognition levels, and the panel data analysis found that treatment with ART is a significant predictor of lower levels of recognition. These results suggest that subjects with more advanced disease receive lower levels of recognition, perhaps due to more visible illness, lower productivity, disclosure of HIV status, and the need for greater care. This interpretation is supported by the analyses of determinants of human recognition levels. Better physical and mental health and better nutritional status are significant independent predictors of receiving higher levels of human recognition at baseline. The link between mental health and human recognition appears particularly strong. Endogeneity of the *mental health* variables in these models suggests that the same factors are at work influencing both mental health and recognition, and that human recognition and mental health may reinforce each other. Indeed, many of the factors that Patel and

Kleinman (2003) identify as influencing mental health in developing countries are rooted in human recognition transactions.

There is evidence of a gender divide in human recognition as well. Women receive significantly lower levels of human recognition at baseline than men, though when mental health status is controlled for and endogeneity addressed, the effect of sex is no longer significant. This relationship among being female, lower levels of mental health, and receipt of lower levels of human recognition merits further study.

Improvements in human recognition are greater at district and provincial hospitals than at urban slum clinics in Nairobi, even after controlling for various demographic, socio-economic, and health variables. Possible explanations include differences in how interventions are implemented at the two types of sites or different household, community, and other sources of support.

Within individual subjects, deviation from one's mean human recognition level over time is a significant predictor in some specifications of deviation in BMI in the same direction, suggesting human recognition's contribution to health and nutrition. While human recognition is a significant independent predictor of subjective well-being status at baseline in the initial models, once endogeneity is addressed, the human recognition variable is no longer significant. Similarly, in the models of changes in subjective well-being, change in human recognition is not significant once endogeneity is addressed, though smaller samples may account for part of the loss of significance. The program interventions did not include components designed specifically to influence human recognition, and the relationship between changes in recognition and changes in well-being may differ in program settings where recognition is deliberately addressed.

Limitations to the study offer lessons for future research on this topic. Human recognition was measured primarily through self-reporting. While this allowed human recognition to be directly identified, it meant that what was being measured were subjects' perceptions of the recognition they received. This perception may differ from the recognition others are actually providing, and it was not possible to collect data from other household members about recognition provided. However, for the purposes of assessing impacts on those receiving recognition, an individual's perception of recognition received may be most relevant.

Missing data due to attrition and missed appointments and data collection posed a challenge to analysis, reducing the power of results, especially when differenced models were used and when leading values were used as instruments. While the study applied a number of mechanisms to improve follow-up, the high rates of attrition and missed appointments reflect the situation among HIV treatment clients in Kenya at the time.

Notwithstanding these limitations, the study points to the impact programs can have on human recognition, the relevance of human recognition to other outcomes of interest, and the feasibility of measuring human recognition. Researchers and programs may consider explicitly incorporating human recognition components into studies and into program design and evaluation in order to improve understanding of human recognition's role in development and to strengthen program outcomes.

Appendix: Factor Analysis Results

All factor analyses generate one strong factor with low uniquenesses (except for the *eat_together* variable discussed below) and factor loadings that are consistent with interpreting the factor to be receipt of human recognition in the specified domains. Results are quite similar at each month – though the number of observations varies – and baseline results are shown illustratively.

The factor analysis for human recognition received in the household at baseline is based on the following model:

$$\begin{aligned}
 \text{self-reported_recognition_hh}_i &= \lambda_{1\text{srh}}\text{hhrecognition}_i + \lambda_{2\text{srh}}\text{eat_together}_i + \delta_{i\text{srh}} \\
 \text{respect_hh}_i &= \lambda_{1\text{rh}}\text{hhrecognition}_i + \lambda_{2\text{rh}}\text{eat_together}_i + \delta_{i\text{rh}} \\
 \text{view_problems_hh}_i &= \lambda_{1\text{vph}}\text{hhrecognition}_i + \lambda_{2\text{vph}}\text{eat_together}_i + \delta_{i\text{vph}} \\
 \text{eat_together}_i &= \lambda_{1\text{et}}\text{hhrecognition}_i + \lambda_{2\text{et}}\text{eat_together}_i + \delta_{i\text{et}}
 \end{aligned}$$

$i = 1, 2, \dots, 763$

Hhrecognition_i is the latent variable of human recognition that *i* receives in the household; λ s are factor loadings; and δ_{ix} are unique factors (i.e. error terms). The letter subscripts (srh...et) refer to the four measured variables. Two factors are included in the model because two factors achieve Eigenvalues ≥ 1 .

Table A1: Factor Analysis Results for Human Recognition Received in the Household at Baseline by Study Subjects (including eating together)

Measure	Factor 1 Loadings	Factor 2 Loadings	Uniqueness
Self-reported level of respect received from household members	0.909	-0.012	0.174
How household members view subject's problems and needs	0.868	0.007	0.247
Self-reported recognition and value received from household members	0.922	-0.027	0.150
Whether eat together with other household members at least once a day	0.029	0.9995	0.0002
<i>Eigenvalue</i>	<i>2.43</i>	<i>1.0</i>	

Results (Table A1) indicate that variations in the three self-reported responses are closely correlated, but variation in *eat_together* is not correlated with the other variables. In fact, when only Factor 1 is retained, the uniqueness for the *eat_together* measure leaps to 0.9995 (results not shown). Factor 2 appears to be whether or not subjects eat with other members of the family, and there is not a common factor underlying this variable and the others. Consistent with the spirit of exploratory factor analysis, this variable is dropped from the factor analysis.

Table A2: Factor Analysis Results for Human Recognition Received in the Household at Baseline by Study Subjects (not including eating together)

Measure	Factor 1 Loadings	Uniqueness
Self-reported level of respect received from household members	0.908	0.175
How household members view subject's problems and needs	0.870	0.244
Self-reported recognition and value received from household members	0.920	0.153
<i>Eigenvalue</i>	2.43	

When the factor analysis is run with only the three self-reported responses (Table A2), more data points can be used because the self-reported data were collected monthly, and the eating together data were collected at baseline, 6 months, and 12 months. The model becomes:

$$\begin{aligned}
 self-reported_recognition_hh_i &= \lambda_{1srh}hhrecognition_i + \delta_{1srh} \\
 respect_hh_i &= \lambda_{1rth}hhrecognition_i + \delta_{1rth} \\
 view_problems_hh_i &= \lambda_{1vph}hhrecognition_i + \delta_{1vph}
 \end{aligned}
 \qquad i = 1, 2, \dots, 857$$

Now all the factor loadings are quite high and the uniquenesses are low. The factor score has a mean of 1.05e-8 and a standard deviation of 1.

The factor analysis for human recognition received in the community and institutions at baseline is based on the following model:

$$\begin{aligned}
 \text{self-reported_recognition_oth}_i &= \lambda_{1\text{stro}}\text{othrecognition}_i + \delta_{i\text{stro}} \\
 \text{respect_oth}_i &= \lambda_{1\text{ro}}\text{othrecognition}_i + \delta_{i\text{ro}} \\
 \text{view_problems_oth}_i &= \lambda_{1\text{vph}}\text{othrecognition}_i + \delta_{i\text{vpho}}
 \end{aligned}
 \quad i = 1, 2, \dots, 714$$

Only one significant factor emerges from the factor analysis. The resulting factor loadings (Table A3) are consistent with the factor being recognition received from non-household members, and the uniquenesses are low. The mean factor score is $-2.9\text{e-}10$ and the standard deviation is 1.

Factor analysis results from months 1 to 12 yield results similar to the baseline.

Table A3: Factor Analysis Results for Human Recognition Received from the Community and Institutions at Baseline by Study Subjects

Measure	Factor 1 Loadings	Uniqueness
Self-reported level of respect received from employers, neighbors, and other non-family members	0.916	0.161
How employers, neighbors, and other non-family members view subject's problems and needs	0.812	0.341
Self-reported recognition and value received from employers, neighbors, and other non-family members	0.932	0.131
<i>Eigenvalue</i>	2.37	

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