



Understanding community health worker employment preferences in Malang district, Indonesia using a discrete choice experiment

Document Version

Accepted author manuscript

[Link to publication record in Manchester Research Explorer](#)

Citation for published version (APA):

Gadsden, T., Sujarwoto, S., Purwaningtyas, N., Maharani, A., Tampubolon, G., Oceandy, D., Praveen, D., Angell, B., Jan, S., & Palagyi, A. (Accepted/In press). Understanding community health worker employment preferences in Malang district, Indonesia using a discrete choice experiment. *BMJ Global Health*.

Published in:

BMJ Global Health

Citing this paper

Please note that where the full-text provided on Manchester Research Explorer is the Author Accepted Manuscript or Proof version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version.

General rights

Copyright and moral rights for the publications made accessible in the Research Explorer are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Takedown policy

If you believe that this document breaches copyright please refer to the University of Manchester's Takedown Procedures [<http://man.ac.uk/04Y6Bo>] or contact uml.scholarlycommunications@manchester.ac.uk providing relevant details, so we can investigate your claim.



TITLE

Understanding community health worker employment preferences in Malang district, Indonesia using a discrete choice experiment

Authors

Thomas Gadsden^{1*}, Sujarwoto Sujarwoto², Nuretha Hevy Purwaningtyas³, Asri Maharani⁴, Gindo Tampubolon⁵, Delvac Oceandy⁶, Devarsetty Praveen^{7,8}, Blake Angell¹, Stephen Jan^{1,9}, Anna Palagyi¹

Institutional affiliations

¹ The George Institute for Global Health, University of New South Wales, Sydney, Australia;

² Department of Public Administration, University of Brawijaya, Malang, Indonesia;

³ Department of Family Medicine, University of Brawijaya, Malang, Indonesia;

⁴ Faculty of Health and Education, Manchester Metropolitan University, Manchester, UK;

⁵ Global Development Institute, The University of Manchester, Manchester, UK;

⁶ Division of Cardiovascular Sciences, The University of Manchester, Manchester, UK;

⁷ The George Institute for Global Health, Hyderabad, India;

⁸ Prasanna School of Public Health, Manipal Academy of Higher Education, Karnataka, India;

⁹ Faculty of Medicine and Health, The University of Sydney School of Public Health, Sydney, Australia.

* Corresponding author

Corresponding authors' contact details

Thomas Gadsden: tgadsden@georgeinstitute.org.au, +61403766781, The George Institute for Global Health, 1 King St, Newtown 2041, NSW Australia

Funding: This study was funded by a Program Grant from the Australian National Health and Medical Research Council (Grant ID: APP1149987). TG is supported by a University Postgraduate Award from the University of New South Wales. AP is supported by a National Health & Medical Research Council (NHMRC) Early Career Fellowship. SJ is supported by a NHMRC Principal Research Fellowship. BA is supported by a NHMRC Emerging Leadership Investigator Grant.

Acknowledgements: We would like to acknowledge Ms. Nirosha Yeddalapudi and Ms. Sridevi Gara from The George Institute for Global Health India for their work in developing the Android DCE application. Additionally, we would like to acknowledge the data collection team from the University of Brawijaya.

Data Availability: Data used for this paper will be made available upon reasonable request.

Word count: 3,615

Competing interests: None declared

Authors' contributions:

Conception or design of the work: AP, SS, GT, AM, SJ, TG, BA, NHP

Data collection: SS, NHP

Data analysis and interpretation: TG, BA, GT, AM

Drafting the article: TG, BA, AP

Critical revision of the article: AM, GT, SJ, DO, PD

1 **ABSTRACT**

2 **Background:** Community health workers (CHWs) play a critical role in supporting health systems,
3 and in improving accessibility to primary health care. In many settings CHW programs do not have
4 formalised employment models and face issues of high attrition and poor performance. This study
5 aims to determine the employment preferences of CHWs in Malang district, Indonesia to inform
6 policy interventions.

7 **Methods:** A discrete choice experiment (DCE) was conducted with 471 CHWs across 28 villages.
8 Attributes relevant to CHW employment were identified through a multistage process including
9 literature review, focus group discussions, and expert consultation. Respondents' choices were
10 analysed with a mixed multinomial logit model and latent class analyses.

11 **Results:** Five attributes were identified: 1) supervision; 2) training; 3) monthly financial benefit; 4)
12 recognition; and 5) employment structure. The most important influence on choice of job was a low
13 monthly financial benefit (~2 USD) ($\beta = 0.53$, 95% CI = 0.43 to 0.63), followed by recognition in the
14 form of a performance feedback report ($\beta = 0.13$, 95% CI = 0.07 to 0.20). A large monthly financial
15 benefit (~20 USD) was most unappealing to respondents ($\beta = -0.13$, 95% CI = -0.23 to -0.03). Latent
16 class analysis identified two groups of CHWs who differed in their willingness to accept either job
17 presented and preferences over specific attributes. Preferences diverged based on respondent
18 characteristics including experience, hours' worked per week and income.

19 **Conclusion:** CHWs in Malang district, Indonesia favour a small monthly financial benefit which likely
20 reflects the unique cultural values underpinning the program and a desire for remuneration that is
21 commensurate with the limited number of hours worked. CHWs also desire enhanced methods of
22 performance feedback and greater structure around training and their rights and responsibilities.
23 Fulfilling these conditions may become increasingly important should CHWs work longer hours.

24 **Keywords:** Community health workers, discrete choice experiment, Indonesia, preferences

25 **What is already known on the topic**

- 26 • Effective community health worker (CHW) programs require adequate training and support,
27 including a mix of financial and non-financial incentives. The Indonesian CHW program is one
28 of the largest and longest-standing programs globally yet has been subject to limited
29 research regarding conditions that support motivation and performance.

30 **What this study adds**

- 31 • A discrete choice experiment with CHWs in Malang district, Indonesia, found a strong
32 preference for a small monthly financial benefit, increasing levels of dissatisfaction as the
33 amount increased and preference for recognition in the form of a report that shows the
34 results of their work.

35 **How this study might affect research, practice or policy**

- 36 • Preference for a lower financial benefit suggests that the value placed by CHWs on such
37 remuneration may be symbolic, as recognition of their contribution to the community,
38 reinforcing the cultural values that underpin the program. Our findings also suggest that
39 kaders value greater feedback of their work and more structure around training and
40 employment conditions.

41 INTRODUCTION

42 Community health workers (CHWs) play an integral role in strengthening primary health care
43 systems by linking communities to health care services (1). They are directly connected to the
44 communities they serve – they live in them and are accountable to them – and, in many cases,
45 receive limited training to provide basic preventive health care services (2). Beyond these
46 commonalities, CHW programs vary widely in terms of training, scope of practice, and remuneration
47 (3). Staffing models for CHW programs range from salaried and relatively well-trained workers to
48 volunteers with minimal training (3, 4).

49 Since the 1978 Alma Ata Declaration, a substantial body of evidence has emerged demonstrating the
50 contribution of CHWs to improved population health outcomes to reducing health disparities (5-7).
51 Similarly, the factors that influence the performance and motivation of CHWs are also much better
52 understood (8, 9). Recent evidence reviews identify a combination of technical enablers such as
53 training, supervision and remuneration, and contextual factors including sustained political support
54 and funding, community embeddedness and integration with the health system (8-10). Yet despite
55 these advances, CHW programs continue to face the same challenges that have constrained them
56 for decades: inadequate financing, lack of supplies and commodities, low compensation of CHWs,
57 and inadequate supervision (11, 12). These factors serve to demotivate CHWs and detrimentally
58 affect retention, thus threatening the sustainability of community-based health programs (13).

59 Indonesia is home to one of the largest and longest-standing CHW programs globally yet has been
60 subject to relatively limited research (3). The community health workforce, known as *kaders*, are
61 village health volunteers whose primary task is to organize monthly village health posts, known as
62 *Posyandu*, where they assist village midwives to provide activities including health and nutrition
63 counselling, immunization campaigns, monitoring and screening activities for diabetes and
64 hypertension, and maternal and child health care (3).

65 In addition to their usual duties, *kaders* in Malang district of East Java Province play a crucial role in
66 the SMARThealth program – a mobile health-supported community-based intervention to optimise
67 preventative care and treatment for cardiovascular diseases. *Kaders* screen community members for
68 cardiovascular risk using a tablet-based application, which provides individual risk information,
69 management plans and decision aids to assist nurses and doctors decide on the appropriate
70 treatment for high-risk patients. Over a two-year trial period in eight villages of Malang district the
71 SMARThealth program reduced the number of people at high risk of cardiovascular disease by 14.5%
72 and was found to be cost-effective (14, 15). In 2020, the program was adopted by the Malang
73 District Health Authority to be scaled up to all 390 villages in the district, a targeted population

74 (those aged 40 years and older) of one million residents. Ensuring that kaders are well-supported
75 and motivated to perform at a high level will be critical to the continued impact of the SMARThealth
76 program at scale.

77 The development of appropriate strategies to support kaders requires an understanding of their
78 preferences for their working conditions. A discrete choice experiment (DCE) is a quantitative
79 survey-based approach to eliciting individual preferences. Respondents are presented with a series
80 of hypothetical choices between two or more alternatives, each of which is described by a set of
81 attributes of varying levels (16). For instance, for patient preferences, respondents may be asked to
82 choose between treatment options that vary in terms of efficacy, cost and side effects. This method
83 allows the analyst to assess the value placed by patients on each attribute and the trade-offs they
84 are prepared to make between them (e.g., how much additional cost would they be willing to bear
85 for more efficacious treatments?) and determine overall treatment configurations that optimise
86 overall patient preferences. Furthermore, heterogeneity in preferences between different types of
87 respondents can be assessed.

88 DCEs have been widely used in health economics research and, more recently, to inform health
89 workforce policies in low-and-middle-income countries (17). The use of DCEs to assess the
90 preferences of CHWs, particularly volunteer CHWs, has steadily grown since 2014 (17-23). Findings
91 often highlight that a mix of financial and non-financial incentives are critical to support the
92 motivation, performance, and retention of CHWs. For instance, in Kenya, Abuya and colleagues
93 found that transport was considered the most important incentive attribute for volunteer CHWs,
94 followed by tools of trade and job incentives that offered higher monthly stipends (24). Most of
95 these studies have been conducted in African countries, with relatively few in Asia and none were
96 identified carried out in Indonesia.

97 In this study we conducted a DCE with kaders in Malang district, Indonesia to assess their
98 preferences for their employment conditions. Results of the DCE will provide health system planners
99 important information on the working conditions that best promote the motivation, performance
100 and retention of kaders and support the scale up of the SMARThealth program.

101 **METHODS**

102 **Study setting and participants**

103 Malang is the second largest district in East Java province with a population of 2,874,204 people
104 distributed across 33 sub-districts and 390 villages: 273 (70%) rural and 117 (30%) urban (2018
105 Census). Kaders are appointed from within their own village by a village committee, to which they
106 are accountable. Kaders are required to receive three days of training on the *Posyandu* curriculum,
107 but previous research has questioned the efficacy of kader training (3, 25). According to Puskesmas
108 law (Indonesian Health Ministry Regulation No. 75 Year 2014), kaders are to be guided and
109 supported at the monthly *Posyandu* by a staff member from the local health centre (*puskesmas*) (3).

110 There is no formalised employment model for kaders and they do not receive a salary. However,
111 kaders typically receive a monthly financial 'gift', the amount of which is set at the discretion of the
112 Village Government and commonly varies between 25,000 – 50,000 (2-4 USD) Indonesian Rupiah
113 (IDR). Research on incentives for kaders is very limited and somewhat contradictory. Of two small
114 qualitative studies, one found that program administrators questioned the necessity of financial
115 incentives for kaders while the other reported that administrators thought that a relatively large
116 monthly financial incentive (500,000 IDR, ~20USD) was an appropriate amount for kaders (26, 27).

117 **Attribute development**

118 Identification and selection of DCE attributes was conducted in a multi-stage process in accordance
119 with the International Society of Pharmacoeconomics and Outcomes Research checklist for conjoint
120 analysis applications in health (28). First, a literature review was conducted to identify employment
121 characteristics of importance to CHWs across a variety of contexts. Secondly, the transcripts of two
122 focus group discussions with kaders were analysed to understand enablers and barriers faced while
123 performing duties. These focus group discussions were conducted as part of the *SMARThealth*
124 program in Malang district.

125 Emerging themes from the literature review and focus group discussions were used as the basis for
126 attributes that were iteratively refined by the authors in consultation with an expert panel of
127 clinicians and public health researchers from the University of Brawijaya, Indonesia. From this
128 process, five attributes were included in the pilot DCE (table 1). Following translation of the
129 attributes and levels from English into Bahasa Indonesia language, a 'think aloud' process was
130 conducted with CHWs (n=5) in Malang district, to test the cognitive intelligibility of attributes and
131 levels (29).

132 **Piloting**

133 The DCE was pilot tested using approximately 10% (n=30) of the intended sample size to test
 134 comprehension and determine whether adjustments in design, descriptions of the attributes and/or
 135 administration were required. Once the final DCE content was decided, it was programmed into an
 136 Android-based application for data collection and field-tested for a final check of usability and
 137 comprehension.

138 **DCE design**

139 The software Ngene V.1.2.0. was used to design a d-efficient, fractional factorial design using a
 140 multinomial logit model. Estimated coefficients for each level were derived from pilot data and used
 141 as prior estimates to generate the final survey tool. The final survey consisted of 24 unlabelled
 142 choice sets, asking participants to choose between two hypothetical jobs that varied in levels of the
 143 attributes. Blocking – whereby the total number of questions is divided equally between two
 144 respondent groups – was used to limit respondent fatigue such that each respondent was asked to
 145 complete 12 questions. Each choice set included an opt out option; respondents were asked to make
 146 an unforced choice (job A, job B or neither job), followed by a forced choice (job A or job B) if
 147 ‘neither’ was selected. Figure 1 shows an example choice set in English.

148 **Table 1.** Final set of attributes and levels

Attribute	Level 1	Level 2	Level 3	Level 4
Supervision	District Health Authority (DHA) representative	Nurse and/or midwife		
Training frequency	Sporadic unstructured training	3-day training course + periodic additional training		
Benefits per month	25,000IDR	100,000IDR	300,000IDR	500,000IDR
Form of recognition	No recognition	Kaders’ screening and referral skills officially endorsed by government	Bi-annual award for Kaders with good performance from the DHA and Head of Village	Report available for Kaders to see results of their work
Employment structure	Employment contract with fixed number of days to work per month	No employment contract and flexible work hours to complete duties		

149

150 The DCE was preceded by a questionnaire assessing respondent sociodemographic characteristics,
 151 years of experience as a kader, hours worked per week and whether they are the main source of
 152 income for the household.

153 **Data collection**

154 Data collection was conducted face-to-face in the local language (Bahasa) using an offline Android-
155 based application on computer tablets. The efficiency and feasibility of conducting DCEs through an
156 Android platform has been previously demonstrated (30). In total, 25 villages were visited for data
157 collection. In each village a member of the research team invited all kaders to the village meeting
158 hall and explained the nature of the study to the participants, went through the introductory
159 statement with them, explained the job sets and how to use the tablet device. Kaders completed the
160 questionnaire themselves. Data collection took place between November 2020 and February 2021.

161 **Sample size**

162 Methods for calculating the required sample sizes for DCEs are debated in the literature, with
163 studies commonly relying on 'rule-of-thumb' estimates or the use of efficient experimental designs
164 (24, 31, 32). The sample size calculation for this study was guided by the rule-of-thumb approach,
165 pragmatic considerations around data collection, and informed by published DCEs in similar cohorts
166 (19, 33, 34). According to the rule of thumb by Johnson and Orme, the minimum sample size for this
167 study was 84 respondents. However, we aimed to improve statistical precision and allow for
168 examination of subgroups by targeting a sample size of 350 – 400 respondents.

169 **Statistical analysis**

170 DCEs are based on the random utility theory, which assumes that each respondent will select the
171 alternative that best maximises their individual utility. In this context, utility can best be understood
172 as an indication of the relative preference that respondents attach to each attribute. The sign of
173 each coefficient (β) reflects whether it has a positive or negative influence for respondents, while
174 the magnitude of the coefficient reflects the size of this influence. Descriptive statistics were used to
175 summarize demographic characteristics of the questionnaire preceding the DCE.

176 Unforced choice data (with options coded as A, B or neither job) were used for all analyses with the
177 respondents' choices as the dependent variable. All attributes were specified as categorical variables
178 and effects coded. Consistent with current guidance, we first tested the financial attribute as a
179 categorical variable to explore linearity (35). Results suggested a non-linear pattern and better
180 model performance than categorising the attribute as a continuous variable; therefore, we coded
181 the financial attribute as three separate parameters. All analyses were conducted using NLOGIT
182 software V.6.

183 Three models were estimated to harvest a rich variety of information about respondent preferences.
184 Initial exploratory analysis was undertaken using a multinomial logit model to estimate preferences

185 across all participants (see online supplemental file 1). However, as this model assumes
186 homogeneity of preferences, which is unlikely to be the case, a mixed multinomial logit model was
187 conducted. The mixed model takes preference heterogeneity among participants into account by
188 allowing attribute coefficients to be randomly distributed with a specified probability distribution
189 (36). All parameters were modelled as random with a normal distribution, including the monthly
190 financial benefit since the base multinomial logit model found both positive and negative
191 coefficients for this attribute.

192 Next, a latent class model was estimated. This method explores whether there are underlying
193 subgroups (classes) within the sample with similar preferences and can be particularly useful to
194 inform policy recommendations (37). The analyst must stipulate the number of classes and which
195 observed variables to include in the model. A two-class model was assessed by the authors to be the
196 most appropriate to interpret the data as larger class models showed minimal gains in model fit
197 statistics and class sizes became too small for meaningful interpretation (online supplemental file 3).
198 Estimated probabilities of group membership were used to examine the characteristics associated
199 with each group, with the largest probability used to determine the group for each respondent.

200 **Figure 1.** Example choice set presented to respondents

201

202 **Ethics**

203 The questionnaire was prefaced by an electronic participant information statement in simple Bahasa
204 Indonesia. Participants were required to confirm that they had understood the participant
205 information statement in order to proceed to the questionnaire; completion of the DCE constituted
206 consent. Ethics approval was granted by the Human Research Ethics Committees of the University of
207 New South Wales (HC190048) and Medical Faculty of University of Brawijaya (Reference:
208 10/EC/KEPK/04/2018).

209 **Patient and public involvement**

210 This research was done without patient involvement due to the subject area and methods chosen.
211 Patients were not invited to comment on the study design, interpret the results or to contribute to
212 the writing or editing of this document for readability or accuracy.

213 In online supplemental file 2, we present a reflexivity statement on the partnership between high-
214 income and low-income and/or middle-income countries.

215

216 **RESULTS**

217 **Characteristics of respondents**

218 A total of 480 kaders participated in the DCE and demographic questionnaire, with 471 complete
 219 results available (Table 2). Nearly all (98.9%) CHWs identified as women, the mean age was 42 years
 220 and CHWs had, on average, 11.2 years of work experience. Just under half of the cohort (45.4%) had
 221 a senior high school education, 46.9% reported an average weekly household income of more than
 222 500,000IDR (35USD) and 46.5% reported working less than 2 hours per week as a CHW.

223 **Table 2.** General characteristics of cohort

Respondent characteristics	N	%
Total respondents	471	100
Age		
20 – 29	57	12.1
30 – 39	143	30.4
40 – 49	163	34.6
50 and above	108	22.9
Female	466	98.9
Education		
Elementary school	85	18.1
Junior high school	144	30.6
Senior high school	214	45.4
University degree	28	5.9
Weekly average household income (IDR)		
250,000 – 500,000 (17 – 35 USD)	250	53.1
500,000 – 1,000,000 (35 – 70 USD)	193	41.0
1,000,000+ (70 – 105 USD)	28	5.9
Hours worked as a kader per week		
<2	219	46.5
2 – 4	152	32.3
4+	100	21.2
Years' experience as a kader		
1 – 9	230	48.8
10 – 19	157	33.3
20+	84	17.9
Main source of household income		
Yes	66	14.0
No	405	86.0

224

225 **Preferences**

226 All 471 participants completed all 12 choice tasks, giving 5,652 observations. The opt-out option was
 227 selected 1,181 times (20.9%); thus, we did not analyse the forced choice data as there was sufficient
 228 information to run the model with the opt-out option.

229 Results of the mixed multinomial logit model are presented in Table 3. Results show that
 230 respondents have a strong preference for the lowest monthly benefit amount ($\beta = 0.53$, 95% CI =
 231 0.43 to 0.63) and found higher amounts unappealing. Regarding forms of recognition, the only
 232 option that appealed to respondents was receiving a report to see the results of their work ($\beta = 0.13$,
 233 95% CI = 0.06 to 0.20). While respondents expressed a marginal preference for having an
 234 employment contract ($\beta = 0.10$, 95% CI = 0.07 to 0.14), the opt-out option was very unappealing ($\beta =$
 235 -0.76 , 95% CI = -0.86 to -0.67) suggesting the range of hypothetical job scenarios presented were
 236 generally not extreme enough to warrant not working under those conditions. Supervision format
 237 and training frequency did not have an influence on respondents choices.

238 **Table 3.** Results from mixed multinomial logit model for full sample ($R^2 = 0.182$, AIC = 10200.1, BIC =
 239 10332.9)

Attribute	Level	β	SE	95%CI		SD
Supervision	District Health Authority	0.03	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
	Nurse and/or midwife	-0.03	0.02	-0.07	0.01	0.21**
Training frequency	Sporadic training	-0.03	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
	3-day training course	0.03	0.02	-0.01	0.06	0.02
Benefits per month (IDR)	25,000	0.53**	0.05	0.43	0.63	0.54**
	100,000	-0.12	0.07	-0.25	0.01	1.25**
	300,000	-0.13*	0.05	-0.23	-0.03	0.16**
	500,000	-0.28	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
Form of recognition	None	-0.03	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
	Official endorsement	-0.06	0.04	-0.13	0.02	0.08*
	Award for good performance	-0.04	0.04	-0.11	0.03	0.08*
	Report on results	0.13**	0.04	0.06	0.20	0.00
Employment structure	No employment contract	-0.10	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
	Employment contract	0.10**	0.02	0.07	0.14	0.03
Neither job	NA	-0.76**	0.05	-0.86	-0.67	1.58**

240 *, **, *** denotes significance at $p < 0.1$, 0.5 and 0.01 respectively; *a* Reference level

241 Latent class analyses

242 The latent class model detect two distinct groups with heterogeneity in preferences, comprising
 243 68.8%, and 31.2% of our cohort, respectively (Table 4). The general characteristics of the groups are
 244 shown in online supplemental file 4. Kaders in group 1 (68.8% of the sample, $n=324$) were more
 245 likely to be older, have more years' experience, work less hours per week and have a higher average

246 income. Comparatively, those in group 2 (n=31.2%, n=147) were younger, less experienced, had a
247 lower income and work more hours per week.

248 The most significant divergence of preferences was in relation to the opt out option. Group 1 kaders
249 were highly unlikely to reject either of the jobs presented ($\beta = -4.41$, 95% CI = -3.89 to -4.92), while
250 those in group 2 preferred not to accept either job ($\beta = 1.46$, 95% CI = 1.35 to 1.57). Reflecting this
251 sentiment, group 1 kaders expressed marginal preference for the current supervision format ($\beta =$
252 1.23, 95% CI = 0.55 to 1.92), while those in group 2 strongly disliked it ($\beta = 1.23$, 95% CI = 0.55 to
253 1.92). Preference for a small monthly financial benefit was consistent across both groups.

254 **Table 4.** Latent class logit model results (n=471, McFadden pseudo R²=0.269, AIC = 9121.6, BIC = 9261.1)

Attribute	Level	Group 1 – 68.8% of sample			Group 2 – 31.2% of sample		
		β	SE	p – value	β	SE	p – value
Supervision	District Health Authority	-0.03	<i>a</i>	<i>a</i>	0.28	<i>a</i>	<i>a</i>
	Nurse and/or midwife	0.03*	0.02	0.07	-0.28***	0.05	0.00
Training frequency	Sporadic training	-0.03	<i>a</i>	<i>a</i>	0.02	<i>a</i>	<i>a</i>
	3-day training course + refreshers	0.03*	0.02	0.09	-0.02	0.04	0.65
Benefits per month (IDR)	25,000	1.00***	0.26	0.00	0.72***	0.07	0.00
	100,000	-0.73***	0.26	0.01	-0.54***	0.10	0.03
	300,000	-0.86***	0.27	0.00	0.06	0.08	0.47
	500,000	0.59	<i>a</i>	<i>a</i>	-0.12	<i>a</i>	<i>a</i>
Form of recognition	None	-0.09	<i>a</i>	<i>a</i>	0.99	<i>a</i>	<i>a</i>
	Official endorsement	-0.01	0.03	0.73	-0.23***	0.08	0.01
	Award for good performance	-0.01	0.04	0.79	-0.07	0.08	0.39
	Report on results	0.11***	0.03	0.00	0.07	0.08	0.34
Employment structure	No employment contract	-0.08	<i>a</i>	<i>a</i>	-0.02	<i>a</i>	<i>a</i>
	Employment contract	0.08***	0.02	0.00	0.02	0.04	0.73
Neither job	NA	-4.41***	0.26	0.00	1.46***	0.06	0.00

255 *, **, *** denotes significance at p<0.1, 0.5 and 0.01 respectively; *a* Reference level

256 **DISCUSSION**

257 To our knowledge, this is the first DCE to be conducted with the community health workforce,
258 known as kaders, in Indonesia. While we find some level of preference heterogeneity among kaders
259 in Malang district, the majority valued jobs that provide a lower monthly financial benefit,
260 recognition in the form of a report on their performance and more structure around training and
261 contract status. CHWs expressed indifference towards recognition in the form of government
262 endorsement, an award for good performance and higher amounts of the monthly financial benefit.
263 Latent class analysis suggested that the main drivers of preference heterogeneity are age, years' of
264 experience, the number of hours worked per week and income.

265 The most salient finding from this study is that the majority of respondents expressed a strong and
266 consistent preference for the lowest monthly financial benefit and opposition to higher amounts.
267 This unexpected result contrasts with findings studies of community health worker employment
268 preferences conducted elsewhere (18, 21, 22, 24). This may be partly explained by the strong
269 prosocial foundation underpinning Indonesia's kader program, which emphasises the cultural and
270 religious value of 'gotong royong', a concept that promotes communal service and volunteering for
271 one's neighbourhood (38-40). Recent qualitative research suggests that these values remain relevant
272 to kaders, finding that not only did they not expect a financial incentive for their work, but that it
273 may even weaken their motivation (25, 26). Furthermore, the preference for a lower monthly
274 financial benefit found among our study cohort – the majority of whom reported working less than 4
275 hours per week – may suggest that kaders prefer a financial benefit that is commensurate with their
276 workload: previous research has found that kaders who were engaged in a more time-intensive
277 health care intervention were open to receiving a larger monthly financial benefit (27).

278 Recognition is a key motivator of CHWs, yet it can be a challenging concept to capture within a DCE.
279 Similar studies have relied on broad statements indicating a high or low level of support from the
280 community or described forms of recognition that are more akin to incentives such as 'priority
281 health care for family members' or 'career progression' [20, 22]. Our levels for the recognition
282 attribute were informed by the evidence base and highlighted by kaders in our source material, yet
283 only one level influenced respondent choices. Respondent's preference for recognition in the form
284 of a report on their work suggests that kaders prefer some form of performance feedback and
285 appraisal which provides them the means to improve their work. This is consistent with our finding
286 that kaders favour a more structured approach to training opportunities. Assessments of current
287 support systems for kaders are limited, but these findings ties in with previous research that
288 characterised the support provided by village midwives to kaders as unstructured and "not very

289 supportive or motivating” (25). Previous research has shown that enhanced training and supervision
290 of kaders can lead to improved community health outcomes (41-43).

291 Latent class analysis revealed heterogeneity among respondent preferences. Notably, preferences
292 diverged based on respondent characteristics including experience, hours’ worked per week and
293 income. The majority of respondents were more likely to be experienced kaders who worked a small
294 number of hours per week. Results suggest they are satisfied with current working conditions but
295 prefer more structured training, performance feedback and an employment contract. Their dislike of
296 a higher financial benefit may suggest that a small incentive is seen as commensurate with their
297 duties and a higher amount may be perceived to come with the expectation of increased hours and
298 responsibility. Comparatively, around a third of respondents, who are younger and work more per
299 week, expressed dissatisfaction with current conditions. Should the SMARThealth program require
300 kaders to work longer hours, these differences will need to be considered.

301 While it is important to acknowledge these discrepancies, from a policy perspective decisions need
302 to be contextualised to the overall preferences of kaders. In terms of policy relevance, there are a
303 few clear take-aways from this study. First, our finding regarding the current monthly financial
304 benefit suggests that the current policy (of approximately 25,000 – 50,000 IDR per month) is
305 appropriate and acceptable to the majority of kaders in Malang district. Second, kaders’ preference
306 for a report on their work suggests that there may be scope to provide additional forms of appraisal
307 or feedback on their performance suggesting support for the idea of ongoing quality improvement.
308 Previous studies have shown that similar interventions have led to improvements in kader
309 performance (42, 44). Third, marginal preferences for the training attribute and an employment
310 contract suggests that kaders favour a more structured approach to their positions and greater
311 certainty about roles, responsibilities, and rights.

312 **Limitations**

313 Our study sample was not nationally representative and thus, while the findings can be generalised
314 to the Malang district, they may not be applicable to other areas of Indonesia. Second, we did not
315 perform any tests to ensure internal validity of the DCE among participants. Instead, we used a
316 ‘think aloud’ technique to cognitively test our DCE and blocking of the questionnaire to limit the
317 number of scenarios presented and cognitive burden on respondents. Last, due to time and cost
318 considerations kaders were non-randomly sampled for inclusion in the DCE yet this should be
319 mitigated by the large sample size and large number of diverse villages visited for data collection.

320 **CONCLUSION**

321 In this DCE kaders in Malang district, Indonesia indicated a strong preference for a small monthly
322 financial benefit, recognition in the form of a report that shows the results of their work and an
323 employment contract with a fixed number of days to work per month. Importantly, kaders
324 expressed a strong dislike for higher levels of financial benefits, perhaps suggesting resistance to the
325 associated expectations this may bring and the undermining of altruistic motives driving their
326 activities. These findings reinforce the cultural values that underpin the kader program and
327 highlights potential avenues to improve how kaders are supported.

328 **References**

- 329 1. Tulenko K, Møgedal S, Afzal MM, et al. Community health workers for universal health-care
330 coverage: from fragmentation to synergy. *Bull World Health Organ.* 2013;91(11):847-52.
- 331 2. Lehmann U, Sanders D. *Community Health Workers: What Do We Know About Them? The*
332 *State of the Evidence on Programmes, Activities, Costs an Impact on Health Outcomes of Using*
333 *Community Health Workers.* Geneva: World Health Organization; 2007.
- 334 3. Perry H, Zulliger R, Scott K, et al. *Case Studies of Large-Scale Community Health Worker*
335 *Programs: Examples from Afghanistan, Bangladesh, Brazil, Ethiopia, Niger, India, Indonesia, Iran,*
336 *Nepal, Pakistan, Rwanda, Zambia, and Zimbabwe.* USAID; 2017.
- 337 4. Singh D, Negin J, Otim M, et al. The effect of payment and incentives on motivation and
338 focus of community health workers: five case studies from low- and middle-income countries.
339 *Human resources for health.* 2015;13:58-.
- 340 5. Glenton C, Scheel IB, Lewin S, et al. Can lay health workers increase the uptake of childhood
341 immunisation? Systematic review and typology. *Trop Med Int Health.* 2011;16(9):1044-53.
- 342 6. Lassi ZS, Bhutta ZA. Community-based intervention packages for reducing maternal and
343 neonatal morbidity and mortality and improving neonatal outcomes. *Cochrane Database of*
344 *Systematic Reviews.* 2015(3).
- 345 7. Lewin S, Munabi-Babigumira S, Glenton C, et al. Lay health workers in primary and
346 community health care for maternal and child health and the management of infectious diseases.
347 *Cochrane Database Syst Rev.* 2010(3):CD004015.
- 348 8. Kok MC, Dieleman M, Taegtmeier M, et al. Which intervention design factors influence
349 performance of community health workers in low- and middle-income countries? A systematic
350 review. *Health Policy Plan.* 2015;30(9):1207-27.
- 351 9. Scott K, Beckham SW, Gross M, et al. What do we know about community-based health
352 worker programs? A systematic review of existing reviews on community health workers. *Hum*
353 *Resour Health.* 2018;16(1):39.
- 354 10. Pallas SW, Minhas D, Pérez-Escamilla R, et al. Community Health Workers in Low- and
355 Middle-Income Countries: What Do We Know About Scaling Up and Sustainability? *American Journal*
356 *of Public Health.* 2013;103(7):e74-e82.
- 357 11. Perry HB, Chowdhury M, Were M, et al. Community health workers at the dawn of a new
358 era: 11. CHWs leading the way to “Health for All”. *Health Research Policy and Systems.*
359 2021;19(3):111.
- 360 12. Agarwal S, Kirk K, Sripath P, et al. Setting the global research agenda for community health
361 systems: literature and consultative review. *Hum Resour Health.* 2019;17(1):22.
- 362 13. Nkonki L, Cliff J, Sanders D. Lay health worker attrition: important but often ignored. *Bull*
363 *World Health Organ.* 2011;89(12):919-23.
- 364 14. Angell B, Lung T, Praveen D, et al. Cost-effectiveness of a mobile technology-enabled
365 primary care intervention for cardiovascular disease risk management in rural Indonesia. *Health*
366 *Policy and Planning.* 2021;36(4):435-43.
- 367 15. Patel A, Praveen D, Maharani A, et al. Association of Multifaceted Mobile Technology–
368 Enabled Primary Care Intervention With Cardiovascular Disease Risk Management in Rural
369 Indonesia. *JAMA Cardiology.* 2019;4(10):978-86.
- 370 16. Mangham LJ, Hanson K, McPake B. How to do (or not to do) ... Designing a discrete choice
371 experiment for application in a low-income country. *Health Policy and Planning.* 2008;24(2):151-8.
- 372 17. Mandeville KL, Lagarde M, Hanson K. The use of discrete choice experiments to inform
373 health workforce policy: a systematic review. *BMC Health Serv Res.* 2014;14:367.
- 374 18. Agarwal S, Abuya T, Kintu R, et al. Understanding community health worker incentive
375 preferences in Uganda using a discrete choice experiment. *J Glob Health.* 2021;11:07005-.

- 376 19. Abdel-All M, Angell B, Jan S, et al. What do community health workers want? Findings of a
377 discrete choice experiment among Accredited Social Health Activists (ASHAs) in India. *BMJ Global*
378 *Health*. 2019;4(3):e001509.
- 379 20. Saran I, Winn L, Kipkoech Kirui J, et al. The relative importance of material and non-material
380 incentives for community health workers: Evidence from a discrete choice experiment in Western
381 Kenya. *Social Science & Medicine*. 2020;246:112726.
- 382 21. Kok M, Abdella D, Mwangi R, et al. Getting more than “claps”: incentive preferences of
383 voluntary community-based mobilizers in Tanzania. *Human resources for health*. 2019;17(1):1-9.
- 384 22. Lamba S, Arora N, Keraga DW, et al. Stated job preferences of three health worker cadres in
385 Ethiopia: a discrete choice experiment. *Health Policy and Planning*. 2021;36(9):1418-27.
- 386 23. Shiratori S, Agyekum EO, Shibnuma A, et al. Motivation and incentive preferences of
387 community health officers in Ghana: an economic behavioral experiment approach. *Human*
388 *Resources for Health*. 2016;14(1):53.
- 389 24. Abuya T, Mwangi D, Obadha M, et al. Incentive preferences for community health
390 volunteers in Kenya: findings from a discrete choice experiment. *BMJ Open*. 2021;11(7):e048059.
- 391 25. Nasir S, Ahmed R, Kurniasari M, et al. Context analysis: Close-to-community maternal health
392 providers in South West Sumba and Cianjur, Indonesia. REACHOUT Consortium; 2014.
- 393 26. Ormel H, Kok M, Kane S, et al. Salaried and voluntary community health workers: exploring
394 how incentives and expectation gaps influence motivation. *Human Resources for Health*.
395 2019;17(1):59.
- 396 27. Gadsden T, Jan S, Sujarwoto S, et al. Assessing the feasibility and acceptability of a financial
397 versus behavioural incentive-based intervention for community health workers in rural Indonesia.
398 *Pilot and Feasibility Studies*. 2021;7(1):132.
- 399 28. Bridges JF, Hauber AB, Marshall D, et al. Conjoint analysis applications in health--a checklist:
400 a report of the ISPOR Good Research Practices for Conjoint Analysis Task Force. *Value Health*.
401 2011;14(4):403-13.
- 402 29. Eccles DW, Arsal G. The think aloud method: what is it and how do I use it? *Qualitative*
403 *Research in Sport, Exercise and Health*. 2017;9(4):514-31.
- 404 30. Abdel-All M, Angell B, Jan S, et al. The development of an Android platform to undertake a
405 discrete choice experiment in a low resource setting. *Archives of Public Health*. 2019;77(1):20.
- 406 31. de Bekker-Grob EW, Donkers B, Jonker MF, et al. Sample Size Requirements for Discrete-
407 Choice Experiments in Healthcare: a Practical Guide. *The Patient - Patient-Centered Outcomes*
408 *Research*. 2015;8(5):373-84.
- 409 32. Orme BK. Getting started with conjoint analysis: strategies for product design and pricing
410 research. 2006.
- 411 33. Blaauw D, Erasmus E, Pagaiya N, et al. Policy interventions that attract nurses to rural areas:
412 a multicountry discrete choice experiment. *Bull World Health Organ*. 2010;88(5):350-6.
- 413 34. Kruk ME, Johnson JC, Gyakobo M, et al. Rural practice preferences among medical students
414 in Ghana: a discrete choice experiment. *Bull World Health Organ*. 2010;88(5):333-41.
- 415 35. Lancsar E, Fiebig DG, Hole AR. Discrete Choice Experiments: A Guide to Model Specification,
416 Estimation and Software. *Pharmacoeconomics*. 2017;35(7):697-716.
- 417 36. Hauber AB, González JM, Groothuis-Oudshoorn CG, et al. Statistical Methods for the Analysis
418 of Discrete Choice Experiments: A Report of the ISPOR Conjoint Analysis Good Research Practices
419 Task Force. *Value Health*. 2016;19(4):300-15.
- 420 37. Zhou M, Thayer WM, Bridges JFP. Using Latent Class Analysis to Model Preference
421 Heterogeneity in Health: A Systematic Review. *Pharmacoeconomics*. 2018;36(2):175-87.
- 422 38. Bowen JR. On the Political Construction of Tradition: Gotong Royong in Indonesia. *The*
423 *Journal of Asian Studies*. 1986;45(3):545-61.
- 424 39. Suwignyo A. Gotong royong as social citizenship in Indonesia, 1940s to 1990s. *Journal of*
425 *Southeast Asian Studies*. 2019;50(3):387-408.

- 426 40. Utomo ID, Arsyad SS, Hasmi EN. Village Family Planning Volunteers in Indonesia: Their Role
427 in the Family Planning Programme. *Reproductive Health Matters*. 2006;14(27):73-82.
- 428 41. Shankar AV, Asrilla Z, Kadha JK, et al. Programmatic effects of a large-scale multiple-
429 micronutrient supplementation trial in Indonesia: using community facilitators as intermediaries for
430 behavior change. *Food Nutr Bull*. 2009;30(2 Suppl):S207-14.
- 431 42. Bait BR, Rah JH, Roshita A, et al. Community engagement to manage acute malnutrition:
432 implementation research in Kupang district, Indonesia. *Bull World Health Organ*. 2019;97:597–604.
- 433 43. Tumbelaka P, Limato R, Nasir S, et al. Analysis of Indonesia’s community health volunteers
434 (kader) as maternal health promoters in the community integrated health service (Posyandu)
435 following health promotion training. 2018. 2018;5(3):8.
- 436 44. Limato R, Ahmed R, Magdalena A, et al. Use of most significant change (MSC) technique to
437 evaluate health promotion training of maternal community health workers in Cianjur district,
438 Indonesia. *Evaluation and Program Planning*. 2018;66:102-10.

439

440

441
442

Supplement 1. Results from multinomial logit model for full sample (AIC = 11822.8, BIC = 11889.2)

Attribute	Level	β	SE	95%CI	
Supervision	District Health Authority	0.08	<i>a</i>	<i>a</i>	<i>a</i>
	Nurse and/or midwife	-0.08	0.02	-0.04	0.02
Training frequency	Sporadic training	-0.02	<i>a</i>	<i>a</i>	<i>a</i>
	3-day training course	0.02	0.02	-0.01	0.05
Benefits per month (IDR)	25,000	0.37**	0.04	0.29	0.44
	100,000	-0.10*	0.04	-0.18	-0.02
	300,000	-0.15**	0.04	-0.23	-0.07
	500,000	-0.12	<i>a</i>	<i>a</i>	<i>a</i>
Form of recognition	None	-0.03	<i>a</i>	<i>a</i>	<i>a</i>
	Official endorsement	-0.04	0.03	-0.11	0.02
	Award for performance	-0.03	0.03	-0.09	0.04
	Report on results	0.10**	0.03	0.04	0.16
Employment structure	No employment contract	-0.07	<i>a</i>	<i>a</i>	<i>a</i>
	Employment contract	0.07**	0.02	0.04	0.11
Neither job	NA	-0.62**	0.03	-0.69	-0.56

443 * Significant at 5% level; **Significant at 1% level or less; *a* Reference

444 **Supplement 2. Model fit statistics for latent class models.**

Model fit statistics	2	3	4
Log-likelihood function	-4539.82	-4457.21	-4042.92
Pseudo R ²	0.269	0.282	0.349
AIC	9121.6	8984.4	8171.8
BIC	9261.1	9216.8	8457.35
Size of the smallest group (proportion of sample)	31.2%	12.3%	2.1%
Size of the smallest group (respondents)	147	58	10

445

446

Domain, questions	Author's response
Study conceptualisation How does this study address local research and policy priorities?	In 2020, a technology-enabled community-based model of care for cardiovascular diseases was adopted by the Malang District Health Authority to be scaled up to 390 villages in the district, a targeted population (those aged 40 years and older) of 2.5 million residents. Volunteer community health workers (Kaders) play a central role in delivering the model of care, including the screening and follow-up of people at high risk of cardiovascular disease. This study provides important information about Kaders' preferred job characteristics. Findings may be used by local authorities to ensure the community health workforce is appropriately supported and motivated to deliver the scaled-up program.
How were local researchers involved in study design?	This study was designed in collaboration with researchers from the University of Brawijaya, Malang District, Indonesia. Local researchers informed development of DCE attributes and levels, conducted the pilot testing, implemented data collection and provided review of the manuscript as co-authors.
Research management How has funding been used to support the local research team(s)?	Funding for this research supported costs associated with local research team members and the implementation of the study pilot and data collection for the full DCE.
Data acquisition and analysis How are research staff who conducted data collection acknowledged?	The data collection team leader is a co-author on the paper and the data collection team is recognised in the acknowledgements section.
How have members of the research partnership been provided with access to study data?	All members of the partnership have access to study data.
How were data used to develop analytical skills within the partnership?	Conducting a discrete choice experiment was a new experience for many members of the research team. Thus, development of the survey, data collection and analysis were learning opportunities for several co-authors.
Data interpretation How have research partners collaborated in interpreting study data?	All researchers – both local and non-local – critically reviewed and evaluated the manuscript, including interpretation of study data.
Drafting and revising for intellectual content How were research partners supported to develop writing skills?	All research partners were encouraged to provide feedback and review of the manuscript.
How will research products be shared to address local needs?	This study and associated pieces of research will be included in a policy brief written in the local language (Bahasa Indonesia) for local research partners, including local government bodies.
Authorship How is the leadership, contribution and ownership of this work by LMIC researchers recognised within the authorship?	The data collection team leader is a co-author on this paper, as are other members of the research team associated with the University of Brawijaya and who provided insight into the development and conduct of the project. The data is co-owned by the relevant LMIC institution, and the researchers involved are able to use it for future analysis, teaching or other non-commercial purposes.
How have early career researchers across the partnership been included within the authorship team?	Early career researchers have played crucial roles in the design of the discrete choice experiment, leading the pilot study and data collection, and conducting analysis of results. More than half of the author group is early- or mid-career, including the first author.

How has gender balance been addressed within the authorship?	Seven authors are male (TG, SS, GT, DO, DP, BA, SJ) and 3 are female (NHP, AM)
Training How has the project contributed to training of LMIC researchers?	Certain early career members of the research team (and co-authors) from Indonesia played a critical role in the design of this study, development and delivery of the discrete choice experiment. This was a new methodology to them and thus has provided a valuable learning opportunity and new skills.
Infrastructure How has the project contributed to improvements in local infrastructure?	The project has not directly contributed to improvements in local infrastructure
Governance What safeguarding procedures were used to protect local study participants and researchers?	All potential participants were provided with detailed information about the study at the time they were invited to participate as part of the informed consent process. This included information about the significance of the research, methods of data collection, confidentiality, risks and benefits and contact details of the research team. This information emphasised that their decision whether or not to participate in the research would have no detrimental impact on the training and support received from local government authorities. All data collected from participants remain completely anonymous. Local researchers involved in data collection followed standard and safety guidelines (including those related to COVID-19) established by the government, and were guided by a study-specific safety protocol.

448 **Supplement 4. Table 1.** Socio-demographic characteristics of estimated groups

Socio-demographic characteristics of estimated groups	Group 1 (%)	Group 2 (%)	χ^2 p value
Average age	43	40	
Proportion aged <29 years	9.3	18.4	0.07
Proportion aged 30 – 39 years	31.2	28.6	0.07
Proportion aged 40 – 49 years	35.2	33.3	0.07
Proportion aged 50 years plus	24.4	19.7	0.07
Proportion with <10 years' experience	47.8	51.0	0.02
Proportion with 10 – 19 years' experience	30.9	38.8	0.02
Proportion with more than 20 years' experience	21.3	10.2	0.02
Proportion with primary school education obtainment	17.6	19.1	0.64
Proportion with secondary school education obtainment	76.9	74.2	0.64
Proportion with university education obtainment	5.6	6.8	0.64
Proportion who work <2 hours per week	55.3	27.2	<0.01
Proportion who work 2 – 4 hours per week	34.9	26.5	<0.01
Proportion who work 4 plus hours per week	9.9	46.3	<0.01
Proportion with avg. weekly income of 250K – 500K IDR	46.9	66.7	<0.01
Proportion with avg. weekly income of 500K – 1 million	46.0	29.9	<0.01
Proportion with avg. weekly income above 1 million IDR	7.1	3.4	<0.01
Proportion who are main source of household income	17.6	6.1	<0.01
Proportion who are not main source of household income	82.4	93.9	<0.01

449