



## The role of public health services (PHS) in agricultural poverty alleviation<sup>☆</sup>



Muhammad Arsyad<sup>a,\*</sup>, Dwia Aries Tina Pulubuhu<sup>a</sup>, Yoshio Kawamura<sup>b</sup>,  
Ida Leida Maria<sup>a</sup>, Andi Dirpan<sup>a</sup>, Andi Alimuddin Unde<sup>a</sup>, Andi Nuddin<sup>c</sup>, Syarifuddin Yusuf<sup>c</sup>

<sup>a</sup> Universitas Hasanuddin, Makassar, Indonesia

<sup>b</sup> Kyoto College of Agriculture, Kyoto, Japan

<sup>c</sup> Universitas Muhammadiyah Parepare, Indonesia

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### Abstract

**Objective:** This paper aimed to prove that PHS positively affects agricultural poverty reduction indirectly.

**Method:** The study employed previous model of Path Analysis. Three-steps regression was run by standardizing data using Z-score method and clustering variables into exogenous, intermediate and endogenous. The research was conducted in South Sulawesi Province, Indonesia by interviewing 28.20% of total farmers households in the province.

**Results:** The results show that the better access to public health services, the higher the household income will be. Thus, if PHS is nearer, the less time and money will be spent to travel, then the more household income at hand will be saved for agricultural input purchasing. In other words, distance to public health services (PHS) appears to be a crucial part of the findings. Therefore, it is reasonable to say that, the better the access to PHS, the more household income will be and in turn it will alleviate poverty of smallholders (agriculture sector, in broad sense).

**Conclusion:** It can be concluded that public health services can help agricultural poverty alleviation though indirectly.

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\* Corresponding author.

E-mail addresses: [arsyad@unhas.ac.id](mailto:arsyad@unhas.ac.id), [arsyad.uh@yahoo.com](mailto:arsyad.uh@yahoo.com) (M. Arsyad).

## Introduction

Health and economy are two goals of sustainable development (SDGs) that are closely related to each other. The SDGs have 17 goals and 169 targets that are expected to be achieved by 2030. Health is the third target, while the economy is the eighth target.<sup>1</sup> Specifically, to achieve goals 3 and 8, all countries that ratify agreements on SDGs must be able to ensure access to public health services (PHS) is fulfilled. Access to health services will reduce the reduction in public economic financing.<sup>2</sup>

In the new global economy, access to public health services (PHS) has become a central issue. Health care access should be based on affordability, physical accessibility, acceptability, and adequacy of supply.<sup>3</sup> In addition, many contributing factors influence access to PHS, including personal barriers, financial barriers, and organizational barriers.<sup>3</sup> Unfortunately, mainly research trapping into disparities issues such as urban-area,<sup>4,5</sup> minority,<sup>6</sup> or young-adolescent.<sup>7</sup> While access to PHS related specific regional seems to be ignored, particularly agricultural sectors.

Agricultural related health problem has its own specific's problem. An agricultural worker is vulnerable to suffers from various disease from acute to chronic. Several studies reported health problems among farmer including heat strain associated with acute kidney injury,<sup>8</sup> anxiety and depression,<sup>9</sup> wide range of stress<sup>10</sup> and chronic obstructive pulmonary disease (COPD).<sup>11</sup> Thus, an Environmental Protection Agency (EPA) recommends full rights and protection.<sup>12</sup> Giving various Agricultural related health problem, there is an urgent need to address the role of PHS, particularly in helping poverty alleviation in agricultural sector.

## Method

The research employed our previous model of Path Analysis. The general model of Path Analysis below;

$Y_t = \beta_1 X_{1t} + \beta_2 X_{2t} + \dots + \beta_k X_{kt} + E_t$ , for  $Y_t$ ,  $X_{it}$  is standardized and  $t = 1, 2, \dots, n$  yields the following equations:

$$Y_t = \left( \sum_q^k \beta_q X_{qt} \right) + E_t. \text{ in which the direct impact of}$$

exogenous variables on each of its respective endogenous can be estimated by path equations:

$$X_1 = E_1 (\text{Path Equation 1, PE 1})$$

$$X_2 = E_2 (\text{PE 2})$$

$$X_3 = E_3 (\text{PE 3})$$

$$X_4 = E_4 (\text{PE 4})$$

$$X_5 = P_{51}X_1 + P_{52}X_2 + P_{53}X_3 + P_{54}X_4 + E_5 (\text{PE 5})$$

$$X_6 = P_{61}X_1 + P_{62}X_2 + P_{63}X_3 + E_6 (\text{PE 6})$$

$$X_7 = P_{71}X_1 + P_{72}X_2 + P_{74}X_4 + P_{76}X_6 + P_{75}X_5 + E_7 (\text{PE 7})$$

The above equations yield a general form,  $X_j = \left( \sum_{q=1}^k P_{jq} X_q \right) + E_j$  for  $(k < j)$ ; where  $P_{jq}$  is a path coefficient of the independent variables, and  $E_j$  is disturbance terms. The estimated values in each one of the above path equations can be obtained (from PE 5 to PE 7) by the formula  $\hat{X}_j = \sum_{q=1}^k \hat{P}_{jq} X_q$ ,  $(k < j)$ ; where a hat ( $\hat{\phantom{x}}$ ) indicates an estimated value. Thus, a path coefficient  $P_{jq}$  is a standardized path coefficient, which is  $b_{jq}^* (S_{xj} / S_{xq})$ . In this case,  $b_{jq}$  is an unstandardized path coefficient, while  $S_{xj}$  and  $S_{xq}$  are, respectively, the standard deviation of  $X_j$  and  $X_q$ . This solution leads us to test a Null Hypothesis ( $H_0$ ) that "there is no significant impact of exogenous variables on endogenous". We measured poverty of smallholders with household income.<sup>13,14</sup>

## Results

We used five independent variables and one intermediate variable in path analysis to regress on household income as poverty proxy (Table 1). It is important to note that the study used an intermediate variable "Government Transfer Source Income" (*hereafter*, transfer income) as an initial step in explaining role of access to the social facility (including public health services) on the poverty in agricultural sector. It means that exogenous variables will send their impact to the Transfer Income, and in turn will affect the poverty situation. In other words, independent variable will send direct and indirect impact on poverty. As shown in Table 1, intermediate variable in the model is Transfer Income ( $X_{62}$ ). There are five independent variables that have direct impacts on "Transfer Income ( $X_{62}$ )". Three out of five variables have direct positive impacts i.e. "Farm Equipment ( $X_{22}$ )", "Cocoa and Irrigated Paddy Field Area with Farm Equipment ( $X_{24}$ )" and "Distance to Public health services ( $X_{36}$ )". These three variables, that have direct positive impacts, can be classified into a moderate impact on our interval. However, the variable Farm Equipment ( $X_{24}$ ) has the highest impacts ( $\beta = .327$ ) followed by "Cocoa and Irrigated Paddy Field Area with Farm Equipment ( $X_{24}$ ,  $\beta = .322$ )" and "Distance to Public health services ( $X_{36}$ , with  $\beta = .223$ )".

## Discussion

### Transfer income and poverty alleviation

Statistically (Table 1), some possible interpretations related to these results above can be explained. The first important finding is that, the larger the cocoa and irrigated paddy field areas with farm equipment is ( $X_{22}$ ,  $\beta = .322$ ), the higher the transfer income will be. This is a fact, the meaning of variable Transfer Income ( $X_{62}$ ) is household income coming from the government. At the same time, it is also generally true that the Indonesian government has been providing, not only financial support (cash transfer) to the inadequate household, especially in rural area such as Social Safety Net Program (for example, Highest Oil Price Compensation), but also the government subsidizes agricultural sector in terms of agricultural input such as fertilizer, chemical pesticide and irrigation infrastructure as well as farm equipment (especially for wetland paddy field) to the smallholders. It

**Table 1** Impact of exogenous variables on the poverty through intermediate.

Number	Exogenous	$\beta$	Intermediate	$\beta$	Endogenous
1	Farm Equipment (X22)	.327	Government Transfer Source Income (X62)	.147	(Poverty, X7)
2	Cocoa and Irrigated Paddy Field (X24)	.322			
3	Social Services Utilization (X33)	-.273			
4	Distance to Public health services (X36)	.223			
5	Agriculture and Non-Agriculture extension (X42)	.206			

means that the larger the paddy field area is, the higher the transfer income from the government to the farmers is needed.<sup>15</sup>

Secondly, the variable distance to public health services, ( $X_{34}$ ,  $\beta = .223$ ) also sends positive direct impact on "Transfer-Income ( $X_{62}$ )". The interpretation of this could be that the further the public health services, the higher the government transfer-source income to the smallholders will be. This is also an obvious fact. The public health services are located further from the smallholder community and often used by the smallholders' family, meaning that public health services are also essential. This situation requires the government to provide public health services closer to the households, which means that the smallholders need the government transfer-income. Thus, it is a reasonable result that the further the public health services, the higher the government transfer-source income will be expected.<sup>16,17</sup>

Besides direct positive impacts, the intermediate variable Government Transfer-Source Income ( $X_{62}$ ) also receives direct negative impacts from two independent variables. These variables are; "Social Service Utilization ( $X_{33}$ )" and "Agriculture & Non-Agriculture Extension ( $X_{42}$ )". However, the first variable has a higher standardized path coefficient ( $\beta$ weight =  $-.273$ ), and a moderate impact in the interval compared to the latter ones (lower  $\beta$ weight meaning a weaker impact). This tells us that the variable Social Service Utilization ( $X_{33}$ ) is much more important than the variable Agriculture & Non-Agriculture Extension ( $X_{42}$ ), for the community, especially in explaining "Transfer Income ( $X_{62}$ )". The interpretation could be that the less access to social services such as PHS, clean water, and education facilities, the higher the transfer-source income will be. This is a persuasive result. The further the health and education facilities, as well as clean water, are; the more government spending on these facilities is allocated, so that rural smallholders also benefits from the expenditure in the health and education sectors as well. This situation requires the government to provide school and public health services closer to the smallholders in rural area, which means that transfer income is needed by smallholders. Some studies suggest that within the education sector, subsidies to primary and to a lesser extent lower secondary education will do most to reach poorer households and raise their living standards. This is also a potentially important conduit for attaining relatively isolated rural households. Within the health sector, subsidies to basic primary health care provide the best option for reaching the poor.<sup>18,19</sup>

### Access to public health services and poverty reduction

Then, intermediate variable Transfer Income sends direct impacts ( $X_{62}$ ,  $\beta = .147$ ) on poverty ( $X_7$ ). Even if this variable has standardized path coefficients ( $\beta$ weight) relatively weak in our intervals-meaning more uncertain impacts, the variable gives crucial information to understand the nature of inadequate household income as a whole. For this, it is possible to say that the higher the transfer income is, the more money (cash transfer) will be received by the poor household to help in their daily lives. This leads us to argue that transfer income from the government to the smallholder community can be still considered in maintaining smallholders' livelihoods, means helping them move out poverty. Besides these direct impacts of transfer income on poverty, (as shown in Table 1), there are also independent variables affect transfer income, i.e. Agriculture & Non-Agriculture Extension ( $X_{42m}$ ,  $\beta = .276$ ), which are categorized into the moderate impacts in our interval of  $\beta$ weights. However, we will not explain the variable in this paper.

We may interpret that, the better access to social services such as public health services (PHS), clean water (Local Government Division for Drinking Water Affairs) and school is, the higher the household income will be. In the research area, within the health sector, for instance, PHS are more often used by the smallholders' families including primary and secondary school for their kids as well as public clean water for drinking. In terms of input side in agriculture sector, if public health services, primary and secondary schools as well as clean water sources are nearer, the less time and money will be spent to travel, then the more household income at hand will be saved for agricultural input. In other words, distance and degree of PHS utilization appear to be an essential part of these interpretations above. Now, this also suggests that improving access to social service facilities-notably PHS, school and clean water closer to the smallholder community-should be considered in order to save more household income so that the poverty level can be gradually reduced in the community.<sup>20</sup>

### Conclusion

It can conclude that government transfer income through Social Safety Net Program positively affect poverty in the agriculture sector. This leads us to argue that transfer income from the government to the smallholder community

(agriculture sector in broad sense) can be still considered in maintaining smallholders' daily life, means helping agriculture sector move out poverty. The better access to public health services is, the higher the household income will be. Thus, if public health services are nearer, the less time and money will be spent to travel, then the more household income at hand will be saved for agricultural input purchasing. In other words, distance to public health services appear to be a crucial part, and in turn it will help poverty alleviation of smallholders (agriculture sector) though indirectly.

## Conflict of interest

The authors declare no conflict of interest.

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## References

- World Health Organization. Status of the health-related SDGs. World Heal Organ. 2017. ISBN:978-92-4-156548-6.
- Acharya S, Lin V, Dhingra N. The role of health in achieving the sustainable development goals. *Bull World Health Organ.* 2018;96:2018–9.
- Gulliford M, Figueroa-Muñoz J, Morgan M, Hughes D, Gibson B, Beech R, et al. What does 'access to health care' mean? *J Heal Serv Res Policy.* 2002;7:186–8.
- Lethbridge L, Johnston G, Henderson D, Intino AFD, McIntyre P. Examining palliative care program use and place of death in rural and urban contexts: a Canadian population-based study using linked data. *Rural Remote Health.* 2015;15:1–13.
- Borders TF, Booth BM, Stewart KE, Cheney AM, Curran GM. Rural/urban residence access, and perceived need for treatment among African American cocaine users. *J Rural Heal.* 2015;31:98–107.
- Bruner DW, Pugh SL, Yeager KA, Bruner J, Curran W. Cartographic mapping and travel burden to assess and develop strategies to improve minority access to national cancer clinical trials. *Int J Radiat Oncol Biol Biol Phys.* 2015;93:702–9.
- Alvarez E, Keegan T, Johnston EE, Haile R. Adolescent and young adult oncology patients: disparities in access to specialized cancer centers. *Cancer.* 2017:1–8.
- Moyce S, Mitchell D, Armitage T, Tancredi D, Joseph J, Schenker M. Heat strain, volume depletion and kidney function in California agricultural workers. *Occup Environ Med.* 2017;74:402–9.
- Torske MO, Hilt B, Glasscock D, Lundqvist P, Krokstad S. Anxiety and depression symptoms among farmers. The HUNT Study, Norway. *J Agromed.* 2016;21:24–33.
- Kearney GD, Rafferty AP, Hendricks LR, Allen DL, Tutor-Marcom R. A cross-sectional study of stressors among farmers in eastern North Carolina. *N C Med J.* 2014;75:384–92.
- Guillien A, Puyraveau M, Soumagne T, Guillot S, Rannou F, Marquette D, et al. Prevalence and risk factors for COPD in farmers: a cross-sectional controlled study. *Eur Respir J.* 2016;47:95–103.
- Bohme SR. EPA's proposed Worker Protection Standard and the burdens of the past. *Int J Occup Environ Health.* 2015;21:161–5.
- Norris AE. Path analysis Munro's statistical methods for health care research: Sixth Edition; 2011.
- Tenenhaus M, Vinzi VE, Chatelin YM, Lauro C. PLS path modeling. *Comput Stat Data Anal.* 2005;48:159, 205.
- Richter L. Why under valuing families is a problem for South Africa's economy. *Conversat.* 2018, <http://dx.doi.org/10.1080/00220388.2012.693168>.
- Reis S, Morris G, Fleming LE, Beck S, Taylor T, White M, et al. Integrating health and environmental impact analysis. *Public Health.* 2015;129:1383–9.
- WHO. World Health statistics 2018. Monitoring health for the SDGs. World Health Organ. 2018. ISBN:978-92-4-156558-5.
- Okyay RA, Tanir F, Ağaoglu PM. Occupational health and safety characteristics of agricultural workers in Adana Turkey: a cross-sectional study. *PeerJ.* 2018;6:e4952.
- Alkire S, Jahan S. The new global MPI 2018: aligning with the sustainable development goals; 2018.
- Hone T, Macinko J, Millett C. Revisiting Alma-Ata: what is the role of primary health care in achieving the Sustainable Development Goals? *Lancet.* 2018;392:1461–72.