MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
ISSN: 1053-7899
Vol. 36 Issue 2, 2026, Pages 788-794

The Consequence of the Special Autonomy Policy on Health Outcomes (A Case study in Papua Province, Indonesia)

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Abstract

The impact of the Special Autonomy policy on household health outcomes in the Province of Papua is the focus of this study. To conduct the analysis, data are utilized from the 2025 Inter-Census Population Survey, the 2025 National Socio-Economic Survey, as well as regional financial records from the Papua Provincial Government. The analytical methods applied include ordinary least squares, ordered logistic regression, and instrumental variables. The findings reveal that the implementation of Special Autonomy in Papua affects household health outcomes, with education playing a key mediating role.

Keywords: impact evaluation, special autonomy, health outcomes, Papua Province, Indonesia.
JEL Classification: I38, I18, I24

INTRODUCTION

Decentralization is currently a major issue primarily aimed at improving the efficiency of resource allocation and enhancing the delivery of public services (Uchimura and Jütting 2009). In practice, decentralization involves the transfer of authority and financial resources from central governments to lower tiers, particularly local governments, thereby enabling more effective provision of local public goods (Bardhan and Mookherjee 2004; Dethier 1999). From the perspective of traditional fiscal federalism, such a shift is expected to improve efficiency in public service delivery, as local governments are better positioned to understand the preferences and needs of their communities (Bradford and Oates 1971b; Robalino, Picazo, and Voetberg 2001; Jiménez-Rubio, Cantarero-Prieto, and Pascual-Sáez 2011; Cavalieri and Ferrante 2016; Sanogo 2019), and are more responsive to the demands of those citizens (Shah and Huther 1999).

There is empirical evidence in several countries that implement a decentralized system experience improvements in health outcomes, such as in Malaysia (Watts 2005), Spain (Garcia-Milà and McGuire 2007), India (Tillin 2007; Shah and Watts 1999), and Indonesia (Madubun and Akib 2017; Mohammad A. Musa'ad 2010). Likewise, several studies have presented evidence of decentralization as part of the provision of health public services, including evidence that decentralization can contribute to reducing infant mortality (Habibi et al. 2003; Robalino, Picazo, and Voetberg 2001; Uchimura and Jütting 2009; Cantarero and Pascual 2008; Jiménez-Rubio, Cantarero-Prieto, and Pascual-Sáez 2011; Samadi et al. 2013), and support local authorities in creating effective health services for communities (Pazarlioğlu et al. 2007; Bossert, Chitah, and Bowser 2003). However, decentralization can also have negative impacts on health services (Collins and Green 1994; Niringiye 2015; Jommi and Fattore 2003; Cahyaningsih and Fitrady 2019), including leading to a decline in service quality that results in poor health outcomes (Asfaw et al. 2008; Lieberman and Marzoeki 2002), and having the potential to cause corruption in local governments (Brueckner 2000; Dethier 2003; Dickovick 2012).Since the enactment of Law No. 22 of 1999 on Regional Government, Indonesia has become one of the prominent examples among developing countries in implementing a decentralized public sector system. This reform was further reinforced by Law No. 25 of 1999 on Central–Regional Fiscal Balance, which established a substantial intergovernmental transfer system over the past two decades (Lewis 2015). Within this framework, Papua represents a distinctive case. As one of Indonesia's provinces, it has been granted special authority under Law No. 21 of 2001 concerning Special Autonomy (Otsus). The implementation of this policy carries significant fiscal consequences, particularly through the provision of additional annual transfers from the central government, amounting to two percent of the National General Allocation Fund (DAU). These funds are specifically intended to enhance public service delivery, with a strong emphasis on the health sector. This asymmetrical fiscal arrangement, combined with broad discretion in fund management, is designed to elevate the living standards of the Papuan population, especially in terms of health outcomes.

Several studies in Indonesia have examined asymmetrical fiscal transfers, particularly to assess the effectiveness of Otsus policy in improving health service delivery. These studies generally rely on financial and health data at the provincial as well as district/municipal levels (DJPK 2017; Wicaksono 2018; Nasrullah, R.S. 2017; Siddik et al. 2019; Widodo 2019; Cahyaningsih and Fitrady 2019; Kartasasmita 2014; Prabowo et al. 2020a; Madubun and Akib 2017). Overall, their findings suggest that the implementation of Otsus in Papua has not yet succeeded in significantly enhancing basic service provision or improving health outcomes in the region. However, existing evidence remains limited in explaining the causal impact of the Otsus policy at the household level. Therefore, it is important to carry out a comprehensive analysis so that it can complement similar studies that have been carried out previously. This study aims to evaluate the impact of special autonomy policies on human capital accumulation as measured by health outcomes. The study's contribution is to add to the empirical literature related to the consequences of the Otsus program in Papua, by taking into account the direct and indirect impacts of the program on health outcomes at the household level through the role of education. By contrast, previous similar studies often neglected the indirect impact of the program.

LITERATURE REVIEW

Evidence from previous research suggests that countries adopting decentralized health systems tend to achieve better health outcomes (Jiménez-Rubio, Cantarero-Prieto, and Pascual-Sáez 2011). Much of this literature highlights the positive effects of decentralization, particularly when assessed through fiscal indicators such as the share of public expenditure or revenue managed by local governments in relation to population health (Jiménez-Rubio, Cantarero-Prieto, and Pascual-Sáez 2011; Asfaw et al. 2008; Uchimura and Jütting 2009; Cantarero and Pascual 2008). However, the findings of Habibi et al. (2003) differed in that they showed a negative relationship between increased income marked by decentralization and infant mortality in a province of Argentina during the period 1970 to 1994. In contrast, an earlier study by Robalino, Picazo and Voetberg (2001), found that fiscal decentralization was associated with lower infant mortality rates between 1970 and 1995. Notably, their results also indicate that the marginal gains from decentralization are more pronounced in countries with lower income levels.

Using data from rural India between 1990 and 1997, Asfaw et al. (2008) constructed a fiscal decentralization index based on expenditure and revenue measures to examine its impact on child mortality. Their findings indicate that decentralization is associated with a reduction in child mortality, and that its effectiveness becomes stronger when accompanied by higher levels of political decentralization. A year later, Uchimura and Jütting (2009) focused on China, employing district-level panel data to assess the relationship between fiscal decentralization and health outcomes. Applying a fixed effects model, they found a significant association between decentralization and lower infant mortality rates over the period 1995–2001. Similar evidence emerges from Spain, where Cantarero and Pascual 2008) demonstrated that fiscal decentralization was negatively correlated with infant mortality across Spanish regions during the 1990s. Finally, Jiménez-Rubio, Cantarero-Prieto and Pascual-Sáez (2011) found that decentralization contributed positively and substantially to the effectiveness of public policies, particularly in improving population health as reflected by declining infant mortality rates.

Meanwhile, in the Philippines, a study by Schwartz et al. (2002) reported mixed outcomes of decentralization in the health sector. Although both the magnitude and proportion of regional health expenditures increased, the range of public health services actually declined, suggesting that a portion of public spending may have disproportionately benefited the private sector. Based on data from more than 1,600 local governments, the study further indicates that local public health spending tended to decrease following decentralization. In terms of health-related behavior, the findings reveal that public health expenditure has a positive influence on family planning programs at both provincial and regional levels. However, the evidence is less conclusive regarding its impact on child immunization, as increased spending does not appear to significantly improve immunization coverage.

Akin, Hutchinson and Strumpf (2005), in their study conducted in Uganda, found that total regional primary health care expenditures in Uganda declined during the 3-year period of decentralization. Their findings show that the share of regional budgets allocated to primary health care declined significantly, from nearly 33% to below 16%. At the same time, expenditure on routine functions experienced an increase. The study also highlights the presence of spillover effects, indicating that districts tend to adjust their health spending decisions in response to the allocation patterns of neighboring districts. Also in Uganda, Hutchinson, Akin and Ssengooba (2006) found that decentralization led to improvements in secondary-curative health services that had the potential to lower the price of primary-preventive health care. These results indicate that people benefit from savings in health care costs because they are subsidized through public spending.

Finally, a study by Jeppsson (2001) provides evidence that decentralization does not always lead to greater funding for health services. The study shows that, in the absence of clear budget allocations from the central government, decentralization may even reduce financial resources for the health sector, effectively limiting decision-making authority at the local level. To explore this issue, Uganda's Ministry of Finance developed a "shadow budget" for the 1996–1997 fiscal year, using data from the 1995–1996 period to estimate how much district and municipal governments would allocate to primary health care. The findings reveal a substantial discrepancy: based on the shadow budget projections, local governments were expected to spend nearly four times more than what was actually realized during the 1996–1997 fiscal year.

MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
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Special Autonomy Policies Pertaining to Health: Development in the Papua region, which has lasted for the almost two decades of Otsus implementation, shows quite important developments in various fields. However, there are still problems and challenges that Papua Province must face. The population in the Papua region, especially the Orang Asli Papua (OAP), still has limited access to basic needs such as basic infrastructure for clean water, sanitation and proper settlements or dwellings as well as low access to health services. Limited access to health services is one of the determinants of the infant and maternal mortality rate in Papua which is relatively high compared to other provinces in Indonesia (Kementerian Kesehatan Republik Indonesia 2019). Through Law Number 21 of 2001 on Otsus for Papua Province, local governments are mandated to ensure the provision of health services and to establish minimum quality standards, especially OAP, which is funded through the receipt of Otsus funds. The amount of the allocation of the Special Autonomy Funding to the Health Sector (DOK-BK) is at least 15% of the regional revenue that comes from DOK. The main objective of DOK-BK allocation is to increase the coverage of community health centers (*Puskesmas*) in the Papuan Health Card (KPS) service to the Papuan people, both in-building and outdoor services, as well as flying and floating health services, providing financial support in implementing the *Puskesmas* operational assistance program to all *Puskesmas* in Papua for primary health services, referrals of patients and their supporters, ensuring the availability of minimal facilities and facilities at the *Puskesmas* in the context of implementing KPS, and improving the quality of *Puskemas* management, especially at *Puskesmas* level planning, and *Puskesmas* mini-workshops to mobilize the potential of indigenous, religious and village officials in improving health status through flying and floating health service programs. The scope of DOK-BK priority programs includes basic health services, support for implementation of BOK for *Puskesmas* management, support for *Puskesmas* facilities and infrastructure, and support for management of district/municipal health offices.Meanwhile, KPS is a health service guarantee provided by local governments to OAP households through several prioritized regional regulations in the form of protection of health services through the support of medical personnel, support for facilities and infrastructure, and support through health funding. The target recipients of KPS are OAP households who live in Papua, and they must fulfill administrative requirements such as having a resident's card from the village head, a family card, an identity card, and they must be registered at the nearest *Puskesmas* or Hospital to receive KPS, and they must use it for get free health services from the local government. In 2018, the number of KPS users increased to 1.3 million from 1.2 million users in 2017. KPS is an extension of the Papua Health Insurance card (JAMKESPA) that has existed since 2009 before changing to KPS in 2014.Between 2002 and 2018, the Papua Provincial Government had spent IDR 4.6 trillion from Otsus revenue to finance the implementation of health sector programs. The main program in DOK-BK, namely in 29 districts/municipalities to achieve the target of health development in Papua, was prioritized to improve the health status of OAP. DOK-BK utilization activities were carried out in an integrated manner by involving program implementers at the *Puskesmas*, traditional leaders, religious leaders, health cadres, and other elements, and could be accounted for according to technical regulations and instructions.The amount of DOK-BK allocation for each Puskesmas was determined by taking into account aspects of the number of residents, especially OAP, area size, geographical conditions, level of difficulty when traveling in the area, coverage and achievement of the previous year's program, the number of health workers in *Puskesmas* and its network, the number of *Poskesdes* and *Posyandu* (smaller health facilities than the Puskesmas), and other parameters determined by the Head of the Health Office by considering local wisdom. The DOK-BK Financial Manager at the *Puskesmas* level could disburse the funds available in the *Puskesmas* account to carry out the DOK-BK Program that had been prepared, for a period of one month based on the action plan resulting from the *Puskesmas* mini workshop. In areas with difficult geographic conditions or where access to *Puskesmas* incurred high costs, funds could be disbursed to accommodate activities for the subsequent several months.Local government intervention to improve the quality of public health services in Papua, both from the supply and demand side through DOK-BK, was expected to reach households in Papua. Meanwhile, the results can be measured by the intervention of local government through the Otsus program, namely the improvement in health status of households in Papua.

METHOD

Data Description: This study uses pooled cross section data or longitudinal surveys sourced from SUPAS 2025 and which focus on the Papua region, making it possible to study a range of results. SUPAS offers a comprehensive overview of households in Indonesia, capturing a wide range of indicators at both the individual and household levels. For policy impact analysis, longitudinal survey data are particularly suitable, as they enable detailed tracking of household members over time. Moreover, such data facilitate the control of unobserved heterogeneity and help address potential issues of reverse causality.

From the SUPAS data used, several variables have been identified, and the main interesting result is the variable that describes the health status of members of the household. The health status of these members is measured through an indicator of the level of complaints of sickness based on respondents' answers to several questions related to illnesses experienced at the time the survey was conducted. Complaints of sickness can be in the form of a person's perception of feelings that cause disruption of daily activities, due to abnormalities or deviation of physical, mental, and social functions that are being experienced and which differ from normal conditions. SUPAS data were also used to identify individual and household characteristics. Individual characteristics related to age, sex, and education. Household characteristics include the age, sex, education level, and main occupation (in the previous week) of the household head, as well as the number of dependents and any deaths in the past five years. Additional information from SUPAS covers housing and facility conditions, including ownership status of the dwelling, access to lighting, sources of drinking water, cooking fuel type, and toilet facilities.

Household expenditure indirectly contributes to the health status of households in Papua. Thus, the authors have collected data on per capita household expenditure sourced from the 2025 National Socio-Economic Survey (Susenas). These data were used in this study as an independent variable in order to assess its effect on health outcomes. Regional financial data were sourced from the Papua Provincial Government, population data, and the number of education levels were sourced from BPS and were used by this study to form program intensity variables and instrumental variables.

An overview of study variables is presented in the attachment of Table 2. The sample consists of 26,499 individuals drawn from 6,131 households. On average, individuals are 23 years old and have not completed the nine-year basic education level. Each household includes approximately five members. In terms of health conditions, households generally fall into the moderate category based on the health problems reported by their members. Most of the sampled households are located in rural areas, where the primary occupations are farming and construction work.

The majority of household heads are male, with the last level of education completed being after 6 years of basic education or SD level. Their average age ranges between 43 and 44 years, with the average per capita household expenditure per month for food and non-food consumption amounting to IDR 865,563. Regarding living conditions, the majority of households reside in owner-occupied dwellings and rely primarily on firewood or charcoal for cooking. Access to electricity from the state provider (PLN) is generally limited, as many households depend on alternative lighting sources. Similarly, drinking and cooking water is predominantly obtained from unprotected sources. Nevertheless, in terms of sanitation, a larger proportion of households use private toilet facilities compared to shared ones.

Identification Strategy: Identification is carried out on individuals in households in Papua who are the main subjects in this study. The thinking behind using households in Papua, without distinguishing OAP and non-OAP households, is based on the DOK-BK management mechanism which is fully managed by the regional government in Papua through the provision of instrumental health inputs. The provision of instrumental health inputs is carried out by bringing in health personnel, procuring health facilities, and building health facilities and infrastructure. It is hoped that the provision of instrumental health inputs can contribute to improving the quality of public health services in Papua. Therefore, households that receive direct and indirect benefits from the Otsus program are households that are domiciled in Papua. The intensity of the Otsus program in the health sector is, albeit indirectly, an explicit function of the health status of the people in Papua which varies from region to region. Rural areas and remote areas in Papua generally have high rates of maternal and infant mortality. These high mortality rates in Papua are due to low public awareness of the health needs of pregnant women, the community environment, the lack of proper empowerment of women, socio-economic factors in households, and education (Dinas Kesehatan Provinsi Papua 2018). The same results were obtained from a study on the rapid review of Papua's Special Autonomy funds, showing that the low quality of health services is indicated by the large number of *Puskesmas* that have not been accredited and that are located in remote and peripheral areas in Papua (Siddik et al., 2019). Therefore, the second focus of the study is to identify the intensity of the program in a specific area.

The basic concept behind the identification strategy for determining program intensity by area is based on what is depicted in Figure 2, which is to compare the probability of there being a low category of health status in urban areas, on one hand, with suburban and remote areas on the other. There is a difference where people who live in rural areas and remote areas have a higher probability of having a low category of health status, compared to residents who live in urban areas. This implies that the provisions of the Otsus program are to allocate more Otsus spending in the health sector to areas that have a high probability of there being a low category of public health. This situation shows that the provisions of the Otsus program are to allocate more DOK-BK to areas that have a low level of health status. The periphery and remote areas in the study represent areas with high program intensity.

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ISSN: 1053-7899
Vol. 36 Issue 2, 2026, Pages 788-794

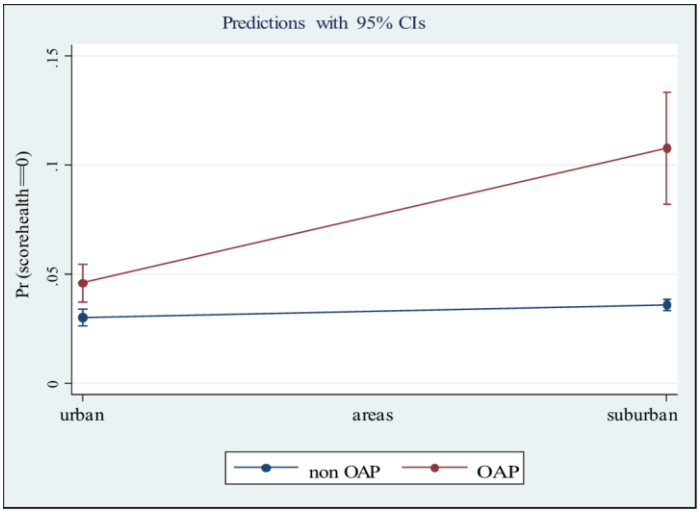

Figure 2. Probability of Low Category Health Across Regions

Source: The author's calculations using SUPAS data from 2025

Ideally, areas that receive a lot of intervention from the Otsus program are those that have a low level of health. Likewise, areas that receive few interventions are areas with a high level of health among the public. It is expected that the health level of the population in both areas will improve over time, but that the improvement is more in areas that receive a lot of interventions or areas with high program intensity. This is, of course, to support the assumption from the impact evaluation that, in the absence of program intervention, the increase in the attainment of the level of public health does not differ systematically between the two regions, so changes in the results obtained are interpreted as a causal effect of an intervention.

The Empirical Model. In Indonesia, the degree to which the community is healthy is measured based on the mortality rate—especially maternal and infant mortality—nutritional status, and morbidity (Indonesian Ministry of Health RI 2018). Public health status is a description of health conditions that occur in general in society and is used to measure or quantify the health conditions faced. This study uses a measure of the level of illness to describe a person's condition in terms of their health. Thus, the specification of model for analyzing program impact follows the model used by Duflo (2001), denoted as seen in equation (1).

$$Y_{ijt} = \beta_0 + \beta_1(P_j * T_i) + \beta_2(C_j * T_i) + V'_{ijt}.\gamma + W'_{jt}.\delta + X'_{jt}.\partial + \varepsilon_{ijt} \quad (1)$$

Where Y_{ijk} denotes the health outcome of individual *i* who was born in region *j*, and in year *t*. β_0 represents the constant, while T_i is a dummy variable capturing the educational status of members in households in Papua, and (P_j) reflects program intensity, proxied by per capita Otsus health expenditure. The interaction variable $(P_j * T_i)$ is included to capture the effect of the program on health outcomes. The variable C_j represents the specific region vector. The interaction variable $(C_j * T_i)$ is used to estimate how program impacts vary across areas with different levels of intensity at the household level, while ε_{ij} represents the error term.

To control observable differences, the model includes vectors of individual, household, and community characteristics $(V_{ijt}, W_{jt}, X_{jt})$. The variable V'_{ijt} represents a vector of individual characteristics including age and sex. While the variable W'_{jt} represents household characteristics, including household size, the age, sex, education, and occupation of the household head, monthly per capita expenditure, and housing and utility conditions (e.g., housing ownership, cooking fuel, water source, lighting, and sanitation facilities). Then, control is also carried out on the environmental characteristics vector (X'_{jt}),, including the number of health facilities and the number of medical personnel.The parameters to be estimated in the study are β_1 and β_2. Parameter β_1 describes the impact of the program on health outcomes. Where, if the parameter β_1 is positive and significant, it implies that the existence of the Otsus program can improve health status at the household level in Papua. On the other hand, if parameter β_1 is negative, then the existence of the program will not have an impact on health outcomes for households in Papua. Meanwhile β_2 shows the impact of the program on household health outcomes in a specific area, namely areas with high program intensity.

Empirical Strategy. In this study, health outcomes were measured through a quality score, indicating a person's health status, obtained by using information on the health of members of each household from the items on the SUPAS questionnaire. Using health-related questions offers two main advantages: it provides a more accurate depiction of actual health conditions, including behavioral characteristics of respondents, and it serves as a standardized instrument for assessing unobservable health conditions, thereby reducing potential measurement errors (Das and Hammer 2005).

The construction of the quality score follows the approach of Rokx et al. (2010) and involves two steps. First, a raw score is calculated based on responses provided by household members regarding their health conditions, as recorded by survey enumerators. This raw score is obtained by means of the score recorded by the official who conducted the interview at the time of the survey based on the responses of members of the household regarding the health problems experienced, and this is multiplied by the number 100, as in equation (2).

$$X_i = \text{score}_{\text{individual}} \text{ x } 100 \quad (2).$$

Following the calculation of the raw score in equation (2), it is subsequently standardized to produce a quality score in the form of a z-score. This transformation expresses how far a given value deviates from the mean of its category, scaled by the corresponding standard deviation. The mathematical equation for the quality score can be seen in equation (3).

$$Z_{score} = \frac{X_i - \bar{X}_i}{sd_i} \quad (3).$$

Where X_i epresents the raw score, $\bar{X}_i$ denotes the mean of the raw scores, and sd_i corresponds to the standard deviation. Meanwhile, Z_{csore} is a standardized (normalized) measure. If the calculation result of equation (1) is connected to equation (3), this results in equation (4).

$$Z_{score}|Y_{ijt} = \beta_0 + \beta_1(P_j * T_i) + \beta_2(C_j * T_i) + V'_{ijt}.\gamma + W'_{jt}.\delta + X'_{jt}.\partial + \varepsilon_{ijt} \quad (4)$$

The Otsus program in Papua affects health outcomes through both direct and indirect pathways. Improved health is partly driven by education, which shapes individuals' awareness of healthy behaviors (O'Donnell, Rosati, and Van Doorslaer 2005). However, most previous studies focus only on the direct effects of Otsus on health, overlooking indirect channels such as education (Prabowo et al. 2020a; 2020b; Siddik et al. 2019; Kartasasmita 2014; Iek and Blesia 2019; Cahyaningsih and Fitrady 2019; Wicaksono 2018; Nasrullah, R.S. 2017). Thus, this study addresses that gap by incorporating the role of education in explaining health outcomes.

Household decisions to use the Otsus program, especially in the health sector are largely shaped by parental characteristics and preferences. Therefore, parental attributes, as well as observed characteristics, can also be estimated in this study. Parents' preferences have the potential to correlate with the Otsus program on health outcomes, and it is difficult to ascertain that they have not changed. Meanwhile, health endowment, reflecting initial health conditions and access to services can influence both healthcare utilization and long-term health status. Previous studies Culyer and Wagstaff (1993) and Wolff and Maliki (2008) attempt to control for health endowment using initial health indicators and the availability of health facilities. However, such controls may be inadequate, as adult health outcomes are shaped by ongoing interactions with the environment and may correlate with unobserved individual traits, thereby introducing bias. For this reason, health endowment is not explicitly controlled for in this study.To address the resulting endogeneity and potential bias in the estimates, an instrumental variable (IV) approach is employed. Three instruments are used: household shocks due to the death of a member, the availability of basic education facilities, and parental education.The first instrumental variable used was household shocks that were local in nature and represented by the occurrence of member deaths in the household. The death of a member in the household can cause the household to experience economic difficulties. The incidence of death is beyond household control and, as a consequence, the household will make various efforts to maintain the continuity of their consumption. One of the concrete options that households can make to maintain sustainable consumption (Alam 2015; Vásquez and Bohara 2010) is to postpone children's enrollment in school. Members of the household will even make a decision to replace the role of breadwinner for the family (Purwanti 2017). The state of shocks experienced by households in the last five years is measured by means of a binary variable, which is one (1) if the household has experienced a death event in the previous five years, and is zero (0) if it has not experienced shocks.The second instrumental variable reflects

MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
ISSN: 1053-7899
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the availability of basic education facilities, measured as the ratio of elementary (SD) and junior high schools (SMP) to every 1,000 individuals of school-age population. The size of this ratio of educational facilities is used to isolate the bias that occurs due to differences in the population totals of districts/municipalities and in areas with high and low population density. Individuals who are directly exposed to surrounding education services can experience improvements in educational outcomes, meaning they have better knowledge and information regarding determinants of good health. In Papua, 30% of students do not complete nine years of basic education, and in mountainous areas around 50% of SD students choose to drop out of school and the figure is 73% for SMP students, because the geographical conditions of the region affects the distance to schools, and this is one of the factors inhibiting the population in Papua from receiving a decent education (Siddik et al. 2019; Maria Anjaryani and Noor Edwina 2020; Wijaya 2017).The third instrumental variable is parental education, both fathers and mothers. Higher educational attainment among parents is associated with greater access to resources such as income, time, energy, and social networks which can enhance their involvement in their children's education (Houtenville and Conway 2008). Educated parents are more likely to possess social and problem-solving skills that support their children's academic success. Empirical evidence from Chevalier (2004), based on British data from 1994–2002, confirms that parental education positively influences children's school performance. Consequently, better-educated parents tend to have greater confidence in supporting their children's learning, which contributes to improved academic outcomes.

The solution with the IV technique is arrived at in two stages, namely first, regressing the program's existence variables through the instrumental variable z_{ij}) with other control variables as in equations (5a and 5b).

$$P_j * T_i = \omega_0 + z_{ij}.\omega_1 + V'_{ijt}.\omega_2 + W'_{jt}.\omega_3 + X'_{jt}.\omega_4 + \varepsilon_{ijt} \quad (5a)$$

$$C_j * T_i = \omega_0 + z_{ij}.\omega_1 + V'_{ijt}.\omega_2 + W'_{jt}.\omega_3 + X'_{jt}.\omega_4 + \varepsilon_{ijt} \quad (5b)$$

In the second stage, equation (4) is estimated by substituting the program impact with the predicted values obtained from equations (5a) and (5b), which yields the specification presented in equation (6).

$$Z_{score}|Y_{ijt} = \beta_0 + \beta_1(\widehat{P_j * T_i}) + \beta_2(\widehat{C_j * T_i}) + V'_{ijt}.\gamma + W'_{jt}.\delta + X'_{jt}.\partial + \varepsilon_{ijt} \quad (6)$$

The estimates derived from equation (6) are intended to yield consistent and unbiased results. To account for disparities in access to public health services, regional characteristics are also incorporated into the analysis. Unobserved heterogeneity across regions is addressed by including district fixed effects in the model, which help control for time-invariant characteristics that cannot be directly observed.

RESULTS

Impacts of the Program on Health Outcomes. The Otsus program in Papua influences health outcomes in households has been able to take place through two mechanisms, namely directly and indirectly through the role of education. A good level of health, shaped by awareness of clean and healthy lifestyles, cannot be separated from the manifestation of education for members of households (O'Donnell, Rosati, and Van Doorslaer 2005). The health measure used in the study to describe health outcomes is the health quality score, which is categorized into three, namely the high category, medium category, and low category (Budi Setyawan 2012). A high health score reflects an overall good condition, where physical, mental, and social functions remain close to normal and do not hinder daily activities. A moderate score indicates some deviation from normal health, although it does not significantly disrupt routine activities. In contrast, a low score signals substantial health deterioration that interferes with everyday functioning.Table 1 presents the estimated effect of the program on health outcomes under the assumption that program intensity is exogenous, so it is estimated using the OLS method. Column (2) reports the direct effect, showing a negative but statistically significant relationship between the program and health outcomes. This negative association may be explained by constraints in public health service provision, including limited health facilities and shortages of medical personnel. The limited availability of public health service facilities is due to the realization of health sector spending sourced from DOK-BK not meeting the minimum allocation stipulated in statutory regulations, particularly the utilization by the health sector (Siddik et al., 2019) The limited availability of public health facilities is also due to the high logistical costs of providing health facilities in Papua.The indirect impact of the program on household health outcomes in Papua is measured by including the education variable, namely the basic education status of members in the household and interacting with the program intensity variable. As shown in column (3), the estimated indirect effect remains negative but statistically significant. These results indicate that the educational factor contributes significantly to health. Wherein, individuals who are educated or at least complete basic education, have a tendency to have better health than individuals who do not complete basic education.

Table 1. Direct Impact of the Program on Health Outcomes

Variable (1)	OLS (2)	OLS (3)
Health outcome variable:		
scorehealth		
Main variable:		
(P_j)	4.482 ** (1.748)	
$(P_j * T_i)$		−0.012 *** (0.001)
Control var. characteristic vector	Yes	Yes
District fixed effect control	Yes	Yes
Statistics		
Sample size	26499	26499
R_2	0.026	0.031

Source: the author's calculations.

Note: The dependent variable: score of high health status (3), moderate (2), low (1). Column (2) ordinary least square (OLS) estimation to see the program's direct impact. Column (3) estimates OLS to see the indirect impact of the program through the role of education. The control variables cover three groups: individual characteristics (age and gender), household characteristics (age, sex, education, and occupation of the household head, household size, per capita expenditure, facilities, and cultural factors), and community characteristics (availability of health facilities and medical personnel). Robust standard errors are shown in parentheses, (***), (**), and (*) and represent a significance level of 1%, 5%, and 10%, respectively. The program's direct impact on household health outcomes in Papua changed when the program was assumed to be endogenous. Table 2 in column (2), where the program is assumed to be exogenous and shows significant results, but this results in a negative direction. Columns (3) represent robustness tests carried out by ordered logistic regression (OLR). The estimation result of robustness test shows a different, but significant relationship direction to the program. Meanwhile in column (4), the program is assumed to be endogenous and the potential for bias can be controlled by making the program variables instrumental. The instruments include household death shocks, the education level of the household head, and the availability of educational facilities. After controlling for potential bias through instrumental variables, the impact of the program on household health outcomes in Papua no longer has a negative relationship but is instead unidirectional and significant. These results indicate that the impact of the program, which shows that Otsus spending on health per population can increase household health outcomes in Papua by 1.4% through the role of education.

Table 2. Indirect Impact of the Program on Health Outcomes

Variable (1)	OLS (2)	OLR (3)	2SLS (IV) (4)
Health outcome variable:			
scorehealth			
Main Variable:			
$(P_j * T_i)$	−0.012 *** (0.001)	−0.116 *** (0.010)	0.014 *** (0.004)
Control var. characteristic vector	Yes	Yes	Yes
District fixed effect control	Yes	Yes	Yes
Statistics			
Sample size	26499	26499	26499
R_2/Pseudo R_2	0.031	0.037	0.010

Source: the author's calculations.

Note: The dependent variable: score of high health status (3), moderate (2), low (1). Column (2) of the ordinary least square (OLS) estimate. Column (3) ordered logistic regression (OLR) estimation: Column (4) estimates the two stages least square (2SLS). Instrumental variables: death of household members,

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education of the head of the household, educational facilities. The control variables cover three groups: individual characteristics (age and gender), household characteristics (age, sex, education, and occupation of the household head, household size, per capita expenditure, facilities, and cultural factors), and community characteristics (availability of health facilities and medical personnel). Robust standard errors are shown in parentheses, (***), (**), and (*) and represent a significance level of 1%, 5%, and 10%, respectively.

These results are consistent with earlier studies which showed a strong relationship between education and health status. Ross and Mirowsky (1999), in their research, found that longer years of schooling are positively associated with better and more stable health status. The argument is built from these conclusions, namely the length of school years can develop an effective life capacity, which in turn will affect health, including working full-time, being able to do a job well, increasing welfare, economy, self-control, more social support, and healthy lifestyles (Ross and Mirowsky 1999). Education can teach people to think more logically and rationally, to be able to observe an issue from various aspects so that they can carry out a more comprehensive analysis when solving a problem. In addition, higher education can improve cognitive skills needed to continue learning outside of school (Laflamme et al., 2004).

The changes in both the value and direction of the relationship resulting from the program's impact on health outcomes align with the study's expectations. These changes indicate that the program variable is endogenous and may bias the estimated parameters. Without accounting for this bias, particularly through the role of education, the program's effect is likely to be underestimated. Therefore, Otsus health spending per capita exerts both direct and indirect influences on household health outcomes in Papua, with education serving as an important transmission channel.

Impact of the Program on Health Outcomes in Specific Areas

Table 3 in column (2), shows the results of the estimated direct impact of the program in rural and remote areas in Papua which indicate that the program's direct impact on health outcomes is statistically significant, but has a negative direction. The direction of the resulting negative relationship is possible because the geographic conditions in areas of Papua, with varying degrees of difficulty in terms of coverage, are a factor in the unequal health service programs provided by local governments, and obstacles to implementation are often encountered. This leads to households in Papua not all being able to benefit from local government programs aimed at improving public health in Papua.

Table 3. The Program's Direct Impacts on Health Outcomes in Specific Areas

Variable (1)	OLS (2)	OLS (3)
Health outcome variable: $scorehealth$		
Main variable:		
(C_j)	-0.082 (0.287)	
$(C_j * T_i)$		-0.008 *** (0.001)
Control var. characteristic vector	Yes	Yes
District fixed effect control	Yes	Yes
Statistics		
Sample size	26499	26499
R_2	0.026	0.028

Source: the author's calculations.

Note: Dependent variable: high (3), medium (2), low (1) health status score category. Column (2) estimated ordinary least square (OLS) to see the direct impact of the program in high intensity areas. Column (3) estimates OLS to see the indirect impact of the program in high intensity areas through the role of education. The control variables cover three groups: individual characteristics (age and gender), household characteristics (age, sex, education, and occupation of the household head, household size, per capita expenditure, facilities, and cultural factors), and community characteristics (availability of health facilities and medical personnel). Robust standard errors are shown in parentheses, (***), (**), and (*) and represent a significance level of 1%, 5%, and 10%, respectively.

To capture the program's indirect effect in rural and remote areas, education status is introduced and interacted with program intensity. As shown in column (3), the relationship remains negative, though it is statistically significant at the 1% level. This suggests that individuals with higher education levels tend to possess better health knowledge, enabling them to adopt preventive behaviors. Such knowledge may be acquired through both formal and informal learning channels (Freudenberg and Ruglis 2008).The program's results in terms of household health outcomes in rural and remote areas undergo change after the program variables are assumed to be endogenous, as shown in Table 4. In Column (2), it is assumed that the program is exogenous and the results are significant with a negative direction of the resulting relationship. Column (3) shows the robustness test results to ensure the consistency of the results obtained, although the direction of the resulting relationship is opposite, it gives meaning to the target parameters. In column (4), endogeneity is addressed using an instrumental variable approach, with instruments including household death shocks, parental education, and the availability of educational facilities. After correcting for potential bias, the estimated effect of the program on household health outcomes in rural and remote areas becomes positive and statistically significant.

These results indicate that Otsus expenditure on health per total population, if allocated to peripheral and remote areas, can cause an increase of 1.7% in household health status in Papua through the role of education. With education, individuals can increase their intellectual maturity, so they can make the right decisions about what they do and choose the right health services for themselves. Changes in the direction and significance of the estimates align with the study's expectations, indicating the presence of endogeneity in the program variables. If the potential for bias is not dealt with by including the role of education, it can cause the education variable to be underestimated. Overall, the results confirm that Otsus health spending exerts both direct and indirect influences on household health outcomes in rural and remote areas of Papua.

Table 4. Indirect Impact of the Special Autonomy Program on Health Outcomes in Specific Areas

Variable (1)	OLS (2)	OLR (3.1)	2SLS (IV) (4)
Health outcome variable: $scorehealth$			
Main variable:			
$(C_j * T_i)$	-0.008 *** (0.001)	-0.081 *** (0.011)	0.017 *** (0.005)
Control var. characteristic vector	Yes	Yes	Yes
District fixed effect control	Yes	Yes	Yes
Statistic			
Sample size	26499	26499	26499
R_2/Pseudo R_2	0.028	0.033	0.012

Source: The author's calculations.

Note: The dependent variable: score of high health status (3), moderate (2), low (1). Column (2) of the ordinary least square (OLS) estimate. Column (3) ordered logistic regression (OLR) estimation. Column (4) estimates the two stages least square (2SLS). Instrumental variables: death of household members, education of the head of the household, educational facilities. The control variables cover three groups: individual characteristics (age and gender), household characteristics (age, sex, education, and occupation of

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the household head, household size, per capita expenditure, facilities, and cultural factors), and community characteristics (availability of health facilities and medical personnel). Robust standard errors are shown in parentheses, (***), (**), and (*) and represent a significance level of 1%, 5%, and 10%, respectively.

DISCUSSION

Although asymmetrical fiscal transfers, resulting from the implementation of Otsus in Papua, have no impact on health outcomes (Cahyaningsih and Fitrady 2019; Siddik et al. 2019; Prabowo et al. 2020b; Kartasasmita 2014; Widodo 2019; Nasrullah, R.S. 2017; Iek and Blesia 2019), this study provides contrasting evidence at the household level. Specifically, Otsus transfers in the health sector are found to improve household health outcomes, with education playing a key mediating role.This relationship can be explained through two mechanisms, as follows: (1) individuals with limited and/or low educational backgrounds, have low quality resources and consequently low income throughout life; and (2) educated individuals have the potential to have better information with regard to accumulated knowledge about the mechanisms of health production (Grossman 1972). Thus, the accumulation of knowledge possessed by individuals will play a role in affecting their health, so it is more productive to use time to improve health independently by utilizing health services, as well as being more responsive to health knowledge.The Otsus program is implemented by local governments primarily through the supply side by providing health service facilities and health workers. Health services can support the improvement of the health status of the public, especially basic health services that are much needed by communities (Knollmueller and Blum 1975). Although the allocation of health facilities and health personnel is not evenly distributed among the districts/municipalities in Papua, this is due to geographical factors which make it impossible for all areas to be reached. However, this study shows significant results, and they have a positive direction. This is partly because local governments complement public provision by collaborating with private hospitals, clinics, and non-governmental organizations to expand access to health services in Papua.

Health outcomes are also determined by the knowledge about health which a person acquires both through formal and informal education. Limited access to information often leads to low awareness of the risks associated with unhealthy behaviors, reducing motivation to adopt healthier lifestyles (Shaw et al. 2014; Pampel, Krueger, and Denney 2010). This lack of knowledge can also affect household decisions regarding the use of health services provided by local governments. Education plays a crucial role in enhancing skills and expanding relevant knowledge, while also shaping attitudes and behavior. Individuals with higher levels of education tend to be more independent, motivated, and confident in maintaining a clean and healthy lifestyle. Consequently, they are more likely to engage in preventive health practices, which are essential for maintaining and improving overall health status (Notoatmodjo 2012).

The second set of findings of this study indicate that the program affects health outcomes in rural and remote areas through the channel of education. In particular, Otsus health spending per capita, when directed to these areas, contributes to improvements in household health. Households in rural and remote regions of Papua generally experience poorer health conditions, largely due to limited socio-economic resources. These constraints restrict access to health services provided by local governments, NGOs, or private providers, and are compounded by long distances to facilities such as Puskesmas. In addition, low levels of health knowledge about clean and healthy behavior (PHBS) are compounded by poor environmental and sanitation conditions. Limited knowledge about health can affect the decisions of households in remote areas about whether to utilize existing health services.

In rural and remote areas, households typically depend on agriculture and its related sub-sectors as their primary sources of livelihood. However, both labor productivity and access to productive assets tend to be low, resulting in limited income. These financial constraints often hinder households from accessing health services. Therefore, the Otsus program, especially in the health sector is beneficial because it can improve household health outcomes in rural and remote areas in Papua.Cultural factors also shape healthcare choices in Papua. Many households, particularly in rural and remote areas, tend to rely on traditional remedies when ill rather than seeking treatment from formal health providers (Dumatubun 2002). This preference is closely linked to prevailing beliefs about health and illness, which are often interpreted through a supernatural lens. As a result, health knowledge in these communities is strongly influenced by such beliefs. Meanwhile, households in urban areas, on average, use rationalism with regard to concepts of health and sickness in overcoming health problems.

CONCLUSION

This study of the impact of the Otsus program on household health outcomes in Papua provides two important findings. First, the Otsus program, which presents its spending on the health sector in per capita terms, has an impact on household health outcomes in Papua through the role of education. The low accessibility in some geographical areas leads to high costs of providing health infrastructure and services. Therefore, the presence of the Otsus program in the health sector has contributed to improving health outcomes. However, the direct effect shows a negative association, which may reflect prevailing cultural beliefs where health and illness are often interpreted through supernatural perspectives, influencing households' decisions to seek formal medical care.

Second, the Otsus program, which presents its spending on the health sector in per capita terms, has had an impact on health outcomes in rural and remote areas in Papua. Generally, members of households in these regions work as farmers and laborers to fulfill their economic needs. The income earned from working as farmers and laborers is relatively limited, so households must make choices to determine the priorities with regard to their needs. This situation causes many household needs to be postponed, including health. Therefore, the existence of the Otsus program, primarily in the health sector and focused on rural and remote areas which generally have a low level of health, is beneficial for households in these areas.

Third, the testing conducted when carrying out a program impact analysis must at least consider unobservable factors that could potentially affect the program. This is because ignoring these factors can lead to omitted variable bias which can, in turn, lead to inaccurate results. For example, in this study, dealing with the potential omitted variable bias can be done by turning the endogenous variables into instruments through educational status. If the program is assumed to be exogenous, the estimates show results that are not true, both for the value and direction of the resulting relationship. Meanwhile, treating the program variables as exogenous ones can give results that are underestimated.

This study of the impact of Otsus on health outcomes was conducted specifically for households in Papua, and is limited by data availability. SUPAS 2025 does not describe which households benefit from social security programs, including the Otsus program, so the estimated effects reflect general rather than program-specific impacts. It would be better if the social security programs that the surveyed households benefited from could be identified and controlled for in order to ensure that changes in health outcomes surveyed could be attributed entirely to the program. Future research should therefore incorporate such controls to generate more detailed and accurate findings, and to better assess the effectiveness of policy interventions.

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ISSN: 1053-7899
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