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RESEARCH ARTICLE



# Measurement and determinants of multidimensional poverty: the case of Hong Kong

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**ABSTRACT**

Multidimensional poverty in urban cities has received growing attention. In this study, the Alkire-Foster method was applied to examine multidimensional poverty in Hong Kong using a random sample of 1,476 Hong Kong adults in a cross-sectional population study undertaken in 2016–2017. Multidimensional poverty was measured on seven dimensions: education, health, mental health, housing, employment, social network, and subjective poverty. The adjusted headcount ratio gradually decreased, and the poverty intensity climbed while the cut-off value of multidimensional poverty increased. Education, employment and subjective poverty made the greatest contribution to multidimensional poverty. Logistic regressions were used to investigate the groups at risk of multidimensional poverty with different deprivation thresholds. Study results show that being female, single, older, a low income and deprived of necessities were risk factors of multidimensional poverty with various poverty cut-offs. Low income and deprivation of necessities correlated but did not overlap with multidimensional poverty. Our findings imply that poverty measurement should be multidimensional, and anti-poverty policy should be more targeted and diversified according to different groups' risks of multidimensional poverty. The implications of these results and limitations are discussed.

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Multidimensional poverty; capabilities; deprivation; Alkire and foster methodology; Hong Kong

## 1. Introduction

### 1.1. Multidimensional poverty

There has been growing concern about the multidimensional nature of poverty and its measurement (Abubakar, 2022; Amarante & Colacce, 2022; Chan & Wong, 2020; Hernández & Zuluaga, 2022; Prieto, 2022). To date, the monetary or income approach has been the most commonly used method to measure poverty (Laderchi et al., 2003). Nevertheless, it has numerous limitations; for example, it overlooks material deprivation and neglects the heterogeneous nature of human well-being, including social dimensions and a health perspective (Sen, 1999; Townsend, 1987). Consequently, scholars have proposed alternative approaches to conceptualize and measure poverty. For example,

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Townsend (1979, 1987) suggested the concept of relative deprivation, the lack of socially perceived necessities (Bradshaw & Finch, 2003). The concept of deprivation of necessities takes account of non-monetary items that are crucial in certain social contexts. The deprivation approach is operationalized using a consensual approach by asking whether people could afford the necessary items (Gordon & Pantazis, 1997). Those who cannot afford specific necessities are identified as 'deprived'. (In this study, we used the term 'deprived of necessities'). The deprivation approach is extensively applied worldwide (Chung et al., 2018; Gordon et al., 2000; Saunders et al., 2014). Another widely used approach is the capabilities approach proposed by Sen (1983, 1985, 1999). Sen argues that income and economic resources have only instrumental but not intrinsic value to individuals. Capabilities represent the human freedom to achieve. He proposed that poverty should be considered lacking basic capabilities, including education, health, social support and housing (Kwadzo, 2015; Nozaki & Oshio, 2016; Wagle, 2002). The capabilities approach has been sufficiently influential that the United Nations, World Bank and other international institutions have adopted it to measure poverty in numerous developing areas worldwide (Hwang & Nam, 2018). The methodology proposed by Alkire and Foster (2011) (hereafter the AF method) is one of the most commonly used methods for studying multidimensional poverty within the capability approach and is explained below. The capabilities approach offers a valuable framework for understanding poverty beyond income or material deprivation. It recognizes that poverty is not solely defined by lack of income or resources, but also by the absence of opportunities and capabilities that enable individuals to live a life they value and desire. One of the key strengths of the capabilities approach is its ability to capture a wide range of factors that contribute to poverty. It recognizes that poverty is a multidimensional phenomenon, encompassing various dimensions of well-being, such as education, employment, health, and social capital. By considering these multiple dimensions, the capabilities approach provides a more holistic understanding of poverty and enables the identification of specific deprivations that individuals may face. Furthermore, the capabilities approach emphasizes the inherent dignity and value of each individual and recognizes that poverty is not merely a lack of income, but a violation of individuals' fundamental freedoms. By adopting the capabilities approach, this paper aims to shed light on the multidimensional aspects of poverty in Hong Kong and contribute to a more comprehensive understanding of poverty.

### 1.2. Alkire–foster counting methodology

The theoretical background of the AF method is based on Sen's capabilities approach to measure capabilities poverty (Alkire, 2005; Sen, 1985). The methodology of the AF method builds on the Foster-Greer-Thorbecke measurement of poverty (Foster et al., 1984), which meets the axiomatic requirements of the poverty measurement proposed by Sen (1976), such as the monotonicity axiom (poverty rises when a person's resources fall) (Alkire et al., 2011). The AF method identifies dimensions of poverty that are considered essential for individuals' well-being within a specific context. By incorporating diverse perspectives, the AF method ensures that the poverty dimensions reflect the priorities and values of the people. Moreover, applying the AF method to measure multidimensional poverty has the advantage of

measuring the breadth and depth of an individual's deprivation by assessing different poverty dimensions (Alkire et al., 2011, 2015). The method employs a counting approach that assesses the number of dimensions in which an individual is deprived and the intensity of deprivation within each dimension. This captures the complexity and multidimensionality of poverty. By utilizing the AF method, researchers can assess poverty in a manner that goes beyond income-based measures and captures the holistic well-being of individuals and communities. It is also sufficiently flexible to measure poverty in different communities as the choice of poverty dimensions depends on the social context.

Traditionally, there are two methods for measuring multidimensional poverty to identify the poor population: union and intersection (Bourguignon & Chakravarty, 2003; Fonta et al., 2020). The union approach counts the poor as people deprived in at least one poverty dimensions. However, this may be problematic as almost everyone could be counted as poor on this basis. The interaction approach identifies someone as poor if they are deprived in all poverty dimensions, so it excludes those who are deprived in some dimensions only. The AF method applies a dual cut-off to deal with these problems. The AF approach involves two stages, identification and aggregation (Alkire & Foster, 2011; Alkire & Santos, 2013).

The identification stage identifies individuals who are deprived based on a cut-off point on a particular poverty dimension. First, dimensions of poverty are determined based on literature, previous studies, and the local standard of living. For each poverty dimension, an indicator is assigned; for example, the number of years of schooling is a standard indicator for the poverty dimension of education. Then, deprivation cut-offs are set, and weightings are assigned for each indicator. A deprivation score for each individual can be calculated by summing up the weighted deprived score in each poverty dimension. It is suggested equal weighting should be assigned to each poverty dimension, as the importance of dimensions may vary among individuals (Alkire & Foster, 2011). Next, a poverty cut-off (k) is applied to identify whether an individual is considered multidimensionally poor if the deprivation score is greater or equal to a certain poverty cut-off.

The adjusted headcount ratio ($M_0$), also known as the multidimensional poverty index (MPI), is calculated in the aggregation stage. MPI measurement satisfies the axioms of poverty measurement, including ordinality, monotonicity and dimensional monotonicity (Alkire et al., 2015; Sen, 1976). The adjusted headcount ratio comprises two parts, incidence of poverty (H) and intensity of poverty (A). The incidence of poverty is also referred to as the multidimensional headcount ratio, meaning the proportion of people who are deprived in different poverty dimensions. H is calculated by the number of people who are multidimensionally poor (q) divided by the total population size of the sample (n).

$$\mathrm{H} = \frac{q}{n}$$

The intensity of poverty is the average deprivation shared among the poor population, which is calculated as follows:

$$\mathrm{A} = \frac{c(k)}{qd}$$

where c(k) is the number of deprived indicators in the cases of the poverty threshold k and d is the number of deprivation dimensions (d).

So, $M_0$, or MPI, is measured as follows:

$$\mathrm{MPI} = \mathrm{H} \times \mathrm{A} = \frac{c(k)}{nd}$$

The contribution (C) of a certain indicator (i) to MPI can be calculated as follows:

$$C_i = \frac{w_i H_i}{MPI}$$

Where $w_i$ represents the weight of indicator i, and $H_i$ represents the deprivation ratio of indicator i.

Using the AF method, the multidimensional poverty index, headcount ratio and poverty intensity can be counted with each poverty cut-off. Moreover, the incidence of deprivation can be analysed among different social groups.

### 1.3. The Hong Kong context

Hong Kong is a global city with high GDP per capita, unaffordable housing costs, and severe income inequality (Chan & Wong, 2020, 2021; Lee et al., 2007; Saunders & Tang, 2019). Recently, the government and the general public in Hong Kong have become increasingly concerned about poverty (Chang et al., 2020; Goodstadt, 2013). The government re-established the Commission of Poverty (CoP) in 2012 to combat poverty. CoP established the official poverty line by applying the income and relative poverty approach. The poverty line threshold was set at 50% of the median household income (Lau, 2015). In 2020, around 1.49 million people counted as income poor before policy intervention; the income poverty rate was 23.6%, higher than in 2019 when it was 21.4% (HKSAR Government, 2021).

Poverty measurement based on the income approach applied by CoP ignored other crucial dimensions of poverty and hence overlooked important areas in setting anti-poverty strategies. For example, the government started to provide 12 years of free primary and secondary education in 2009. Nevertheless, a substantial older population did not receive a good education. In 2016, more than 47% of people aged 55 or above had received only primary education at best (Census and Statistics Department, 2017). On the other hand, health and mental health problems in Hong Kong also generate growing concerns (Lam et al., 2015). Inequalities in health and mental health have been severe in recent years (Chan et al., 2022; Chung & Wong, 2015).

However, none of these dimensions was included in the original analysis of poverty. Moreover, confined living space, limited social networks, and subjective poverty are crucial perspectives of well-being that have generated increasing concern in Hong Kong (Chan et al., 2020; Fung et al., 2021; Guo et al., 2017; Shek, 2021; Shek & Lin, 2014; Shek et al., 2021; H. Wong & Chan, 2019). This study used these dimensions to analyse multidimensional poverty by applying the AF method.

### 1.4. Research gap and aims of the study

The above review reveals that the official measurement of poverty in Hong Kong is limited to an income approach and ignores the multidimensional nature of poverty. Although some studies have applied the AF method to measure multidimensional poverty in China and other Asian contexts (Chen et al., 2019; Hwang & Nam, 2020; Qi & Wu, 2015), few studies of poverty in Hong Kong have done so. This remains a research gap. Furthermore, while previous studies have explored material deprivation in Hong Kong (Chan, 2023; Saunders et al., 2014), as well as social exclusion among specific social groups such as the elderly (Chou, 2018), asylum seekers (Ng, 2019), and disadvantaged groups (Lau et al., 2015), these investigations primarily focused on singular or limited dimensions of poverty. Hence, there is a need for a more comprehensive examination of poverty in Hong Kong, highlighting another research gap that should be addressed. On the other hand, few poverty studies applying the AF method have compared multidimensional poverty with other poverty approaches, especially Townsend's (1987) deprivation approach. This constitutes the third research gap that should be addressed.

This study examined multidimensional poverty in Hong Kong using the AF method and investigated groups at risk of multidimensional poverty. It contributes to applying the AF method to study multidimensional poverty in a high-income global city in a developed region, which differs from developing areas and low-income countries. On the other hand, although research has studied the overlap over some poverty approaches (Bradshaw & Finch, 2003; Posel & Rogan, 2016), no previous studies has examined the relationship between the AF method and other approaches. This study further investigated the relationship between the three main types of poverty, multidimensional poverty with the AF method, income poverty, and deprivation of necessities. The correlation, prevalence, and overlap among these three types of poverty were examined.

## 2. Methods

### 2.1. Data and sample

This study used the data collected by a project entitled 'Trends and Implications of Poverty and Social Disadvantages in Hong Kong: A Multidisciplinary and Longitudinal Study'. The first and second waves of the survey were conducted from June 2014 to August 2015 and from February 2016 to March 2017, respectively. The Census and Statistics Department provided 25,000 household addresses in Hong Kong. The samples were then stratified by living quarters and by district. First, a random sample of living quarters was selected. All households living in the quarters were selected for the survey. Details of the sampling procedure for the first wave of the survey had published elsewhere (Chan & Wong, 2020; Chan et al., 2020; Wong & Chan, 2019).This sampling aims to represent adults aged 18 or above in Hong Kong. The total number of adults interviewed in the first wave was 2,282, with a response rate of 60.2%. Subsequently, one respondent aged 18 or above from each household in the first wave was recruited. In the second wave of the survey, 1,476 people were re-interviewed. Professionally trained interviewers conducted face-to-face interviews with study respondents. This paper focused on examining the prevalence and factors contributing to multidimensional poverty at a specific point in time. To ensure the most current and relevant information for our analysis, we used the

cross-sectional dataset from 2016 to 2017. In the data analysis, missing data were not included in the descriptive results, and only valid percentages were presented.

### 2.2. Dimensions and indicators of poverty

Measuring multidimensional poverty requires the essential dimensions of poverty to be identified. The seven poverty indicators chosen for the study were based on previous literature (Chen & Leu, 2020; Fonta et al., 2020; Hwang & Nam, 2018) and the local situation: education, health, mental health, housing, employment, social network, and subjective poverty (Table 1). Each broad dimension was assigned the same weighting according to the measurement approach proposed by Alkire and Foster (2011).

The dimension of education and health were identified as the most common dimensions counted in multidimensional poverty analysis using the AF method (Chen et al., 2019; Dhongde & Haveman, 2015; Omotoso & Koch, 2018). First, the number of years of schooling was chosen as the indicator for education. A person was considered deprived of education if they received fewer than 12 years of schooling (lower secondary or below). Second, two common health indicators were applied for health, self-rated health and Body Mass Index (BMI). Self-rated health is widely used to assess people's overall health status (Wen et al., 2006). The answers ranged from 'excellent', 'very good', 'good', 'fair', to 'poor'. In this study, respondents who answered 'poor' were counted as deprived in health.

A person was also counted as deprived in health if their BMI was $< 18.5$ or $\geq 25$, regarded as indicating either underweight or obesity in the Asian population (Nishida et al., 2004). Third, the mental health dimension was measured by the Depression Anxiety Stress Scales (DASS-21), comprising 21 self-reported items assessing emotion (Moussa et al., 2001). The survey collected data on anxiety and stress only. Details of the measurement and scoring of DASS have been described previously (Chan et al., 2020). Respondents scoring from 'mild' to 'extremely severe' were counted as deprived in the dimension of anxiety and stress (Lovibond & Lovibond, 1995). Fourth, for housing, the living area was chosen as the indicator. A Hong Kong household is commonly identified as overcrowded if the living area per capita is less than 7 $m^2$, a cut-off adopted by the Hong Kong Housing Authority and employed in previous studies (Chan et al., 2020; Wong & Chan, 2019). A person

**Table 1.** Deprivation dimensions, indicators, cut-off, and weight.

| Dimension | Indicators | Deprivation cut-off (deprived in this area if) | Weight |
|---|---|---|---|
| 1.Education | Years of schooling | Fewer than 12 years of schooling (Lower secondary or below) | 1/7 |
| 2.Health | Self-rated health | Poor self-rated health | 1/14 |
| | Physical health | BMI <18.5 or ≥ 25 | 1/14 |
| 3.Mental Health | DASS – Anxiety | Anxiety (Mild/Moderate/Severe/Extremely Severe) | 1/14 |
| | DASS – Stress | Stress (Mild/Moderate/Severe/Extremely Severe) | 1/14 |
| 4.Housing | Living area per capita | Living area per capita <7 $m^2$ | 1/7 |
| 5.Employment | Employment status | Not working (unemployed, unpaid family worker, disabled, retired, students) | 1/7 |
| 6. Social network | Contact with friends or family members not living together | Once a month or less frequently | 1/7 |
| 7. Subjective poverty | Subjective Poverty | Feeling poor | 1/7 |

was counted as deprived in the housing dimension if their living area per capita density was less than 7 $m^2$.

Fifth, employment plays a vital role in measuring multidimensional poverty, with precarious employment and low job quality being significant factors contributing to poverty (Pun et al., 2022; Wong & Au-Yeung, 2018; Wong & Au-Yeung, 2019). Employment status was measured as one key dimension. Those who were not working, including the unemployed, unpaid family workers, and the disabled (Hwang & Nam, 2020), were counted as deprived in this dimension. Sixth, social network, another crucial dimension of poverty (Chan & Wong, 2020), was measured by the frequency of contact with friends or family members who did not live together. Those with contact frequency once a month or less were considered deprived in the social network dimension. Seventh, the subjective dimension, suggested as an important poverty dimension (Alkire, 2007; Angulo et al., 2016), was measured by asking respondents, 'Do you think you are poor now?'. Those responding 'yes' were counted as subjectively poor and deprived in this dimension. Table 1 provides all the dimensions, indicators, deprivation cut-offs and weighting.

### 2.3. Income poverty and deprivation of necessities

The equivalised monthly household income (EHI) was applied to measure household income and income poverty, taking account of the differences in family composition and household size. The EHI was calculated by dividing the household income by the square root of the number of household members. Those with an EHI less than the median EHI in the survey were counted as income poor.

Deprivation of necessities was assessed by respondents' ability to afford a range of items considered necessary in Hong Kong. 301 respondents were randomly selected to answer whether they perceived that a range of daily activities and materials were necessities. Twenty-one items were selected by more than half of the respondents as necessities; these items comprised the deprivation index used in the study. The weighted deprivation index was compared by the EHI deciles; those scoring ≥ 2 were considered 'deprived of necessities'. Details of the background to the calculation and validation of the deprivation index and the cut-offs and a list of the 21 items have been described previously (Chung et al., 2018; Wong & Chan, 2019).

### 2.4. Analytic strategy

The data used in this study were weighted according to the distribution of sex and age in Hong Kong census data in mid-2016 to enhance the study's representativeness. First, descriptive statistics of the respondents' demographic backgrounds were presented. Then, the incidence of deprivation among different social groups with various demographic backgrounds was examined. Next, the multidimensional poverty situation was investigated with different poverty cut-offs. The multidimensional poverty index, multidimensional headcount ratio, and multidimensional poverty intensity were counted with different deprivation thresholds k by applying the AF method The contribution of each poverty dimension to MPI was calculated and presented.

After that, binary logistic regression was performed with being poor, with different cut-off k (k = 1, 2, 3 and 4), as the dependent variable (DV). Pairwise deletion was employed in regression analysis to handle the missing values. A poor individual was counted as '1' while the non-poor was counted as '0'. The independent variables (IVs), also predictors, included demographic information such as gender, age, marital status and household size. Previous literature has demonstrated the significant relationship between demographic backgrounds and multidimensional poverty. For instance, Chen and Wang (2015) found that being female and aged 65 or above were associated with a higher likelihood of experiencing multidimensional poverty. Family types and marital status have also been identified as crucial factors in several studies (Chen & Wang, 2015; Wu & Qi, 2017). Building upon these findings, we incorporated these potential risk factors into our logistic regression model to examine their associations with multidimensional poverty in our study. This aimed to identify the risk factors of the multidimensionally poor. For each poverty cut-off k, both the univariate model crude odds ratio and the multivariate model with adjusted odds ratio were performed. It is assumed that household characteristics are significantly associated with poverty.

Three mainstream types of poverty, multidimensional poverty using the AF method ('multidimensional poverty'), income poverty using the monetary approach ('income poverty'), and deprivation of necessities by consensual approach ('deprived of necessities'), were then compared. Prevalence, correlation and overlap were calculated and are discussed below.

## 3. Results

### 3.1. Descriptive results and prevalence of multidimensional poverty

Table 2 summarizes the sociodemographic characteristics of the sample in comparison with the Hong Kong adult population during the data collection period. Missing data were not included in the descriptive results, and only valid percentages were presented. Overall, the incidence of deprivation in years of schooling, self-rated health, BMI, anxiety, stress, living area per capita, working status, social connection, and subjective poverty was 48.6%, 6.8%, 43.6%, 11.7%, 6.2%, 9.1%, 45.1%, 20.6% and 28.3%, respectively. The prevalence of deprivation was counted among different groups by sex, age, marital status, and household size. Generally, males had worse BMI (46.6%) and social network (21.8%), while more females were deprived in the employment dimension (53.8%). On the other hand, older people were more deprived in education (84.0%), health (poor self-rated health: 13.8%; abnormal BMI: 52.9%), and mental health (anxious: 14.5%). Singletons were more deprived than families with two or more members in several areas: education (75.7%), self-rated health (19.1%), and subjectively poor (43.7%). More details are reported in Table 3.

The measurement of multidimensional poverty using the AF method for various poverty cut-offs (k) is presented in Table 4. The poverty cut-off (k) represents the threshold of deprivation. For a particular value of (k), people were counted as in poverty if they faced more or equal to that number of deprived dimensions. The $M_0$ and H decreased as k increased. However, the value of A increased as k rose. In other words, the size of the poor populations dropped when the deprivation threshold increased, but the poverty

**Table 2.** Demographic information and socioeconomic situation of respondents.

| | | Weighted % | N |
|---|---|---|---|
| Sex | Male | 45.1 | 664 |
| | Female | 54.9 | 809 |
| Age | 18–40 | 36.8 | 542 |
| | 41–59 | 36.9 | 544 |
| | ≥60 | 26.2 | 387 |
| Educational attainment | Primary or below | 26.1 | 385 |
| | Lower secondary | 22.5 | 331 |
| | Upper secondary | 30.8 | 454 |
| | Tertiary or above | 20.6 | 303 |
| Marital status | Married/cohabiting | 58.7 | 864 |
| | Single/separated/divorced/widowed | 41.3 | 609 |
| Employment status | Full-time work | 45.4 | 669 |
| | Part-time work | 9.5 | 140 |
| | Not working/economically inactive | 45.1 | 664 |
| Household size | 1-person | 9.2 | 136 |
| | 2-person | 16.0 | 236 |
| | 3-person | 26.1 | 384 |
| | 4-person | 30.3 | 447 |
| | 5-person or above | 18.3 | 270 |
| Income poverty | Income poor | 14.7 | 209 |
| | Income non-poor | 85.3 | 1211 |
| Deprivation of necessities | Deprived | 10.5 | 154 |
| | Not deprived | 89.5 | 1316 |

intensity rose simultaneously. For example, when k = 1, the values of $M_0$, H, and A were 0.258, 0.791, and 0.327, respectively. However, when k = 3, the corresponding values were 0.120, 0.230, and 0.521. On the other hand, it is worth noting that the value of $M_0$ dropped to 0.01 when k = 5 and further decreased to 0 when k = 7, implying that very few people in the sample faced more than four dimensions of deprivation. Nevertheless, the high value of poverty intensity means that people faced serious poverty situations.

The contribution of each poverty dimension to overall multidimensional poverty varied with different deprivation thresholds (k). The patterns of contribution are presented in Table 5. Generally, education, employment, and subjective poverty were the three main contributors to multidimensional poverty with various deprivation thresholds. The contribution of education and employment dropped when the poverty cut-off (k) increased. For example, the contribution of education was 0.269 when k = 1, while it decreased to 0.186 when k = 5. On the other hand, the contribution of housing and subjective poverty increased when the poverty cut-off (k) rose. This indicated that some poverty dimensions became more crucial when the household faced different levels of multidimensional poverty.

### *3.2. Determinants of multidimensional poverty*

Logistic regression analysis was performed to examine the risk factors of multidimensional poverty with different deprivation thresholds as there were very limited cases of poverty when k ≥ 5; the regression analysis was only performed for deprivation threshold k ≤ 4. When k = 1, in the univariate model, gender, age, marital status, and household size were all significantly associated with poverty. Age and marital status remained significant when all IVs were put into the multivariate logistic regression model. Compared with those aged 18 to 40, respondents aged 60 or above were more associated with poverty

**Table 3.** Incidence of deprivation among social groups.

| | Education | Health | | Mental Health | | Housing | Employment | Social network | Subjective poverty |
|---|---|---|---|---|---|---|---|---|---|
| | Fewer than 12 years of schooling | Poor self-rated health | Abnormal BMI | Anxiety | Stress | Living area per capita ≤7 $m^2$ | Not working | Poor social connection | Feeling poor |
| Sex | | | | | | | | | |
| – Male | 47.7% | 6.4% | 46.6% | 11.5% | 5.7% | 9.3% | 34.5% | 21.8% | 28.5% |
| – Female | 49.4% | 7.1% | 41.1% | 11.8% | 6.7% | 9.0% | 53.8% | 19.6% | 28.2% |
| Age | | | | | | | | | |
| – 18–40 | 15.3% | 1.6% | 34.9% | 9.2% | 6.1% | 10.7% | 32.0% | 14.7% | 24.2% |
| – 41–59 | 56.7% | 7.0% | 45.8% | 12.1% | 6.3% | 10.0% | 31.4% | 23.4% | 30.0% |
| – 60 or above | 84.0% | 13.8% | 52.9% | 14.5% | 6.3% | 5.6% | 82.7% | 24.9% | 31.8% |
| Marital status | | | | | | | | | |
| -Married/ cohabiting) | 54.3% | 4.6% | 44.5% | 9.2% | 5.4% | 11.9% | 41.7% | 20.5% | 27.5% |
| - Single/ separated/ divorced/ widowed | 40.5% | 9.8% | 42.3% | 15.2% | 7.4% | 5.1% | 49.9% | 20.7% | 29.5% |
| Household size | | | | | | | | | |
| – 1-person | 75.7% | 19.1% | 47.8% | 18.9% | 7.6% | 2.5% | 68.4% | 22.7% | 43.7% |
| – 2-person | 53.3% | 9.5% | 48.0% | 13.8% | 4.4% | 0.0% | 50.8% | 20.8% | 28.7% |
| – 3-person | 45.9% | 5.0% | 39.7% | 13.6% | 5.6% | 3.3% | 41.9% | 20.5% | 25.9% |
| – 4-person | 43.6% | 4.6% | 43.5% | 9.4% | 8.0% | 7.3% | 39.2% | 19.0% | 27.6% |
| – 5-person or above | 43.0% | 4.5% | 43.4% | 7.2% | 5.1% | 31.7% | 42.7% | 22.1% | 24.8% |
| Total population | 48.6% | 6.8% | 43.6% | 11.7% | 6.2% | 9.1% | 45.1% | 20.6% | 28.3% |

**Table 4.** Multidimensional poverty estimates for different poverty cut-offs.

| Poverty cutoff/deprivation threshold (k) | Adjusted headcount ratio ($M_0 = H \times A$) | Multidimensional headcount ratio (H) | Multidimensional poverty intensity (A) | Average deprivation among the deprived ($A(k) = A \times d$) |
|---|---|---|---|---|
| 1 | 0.258 | 0.791 | 0.327 | 2.28 |
| 2 | 0.211 | 0.513 | 0.410 | 2.87 |
| 3 | 0.120 | 0.230 | 0.521 | 3.65 |
| 4 | 0.05 | 0.080 | 0.633 | 4.43 |
| 5 | 0.01 | 0.018 | 0.752 | 5.26 |
| 6 | 0.00 | 0.002 | 0.797 | 5.57 |
| 7 | 0.00 | 0.000 | N/A | N/A |

Note. k = Deprivation threshold; $M_0$ = Adjusted headcount ratio; H = Multidimensional headcount ratio; A = Multidimensional poverty intensity.

**Table 5.** Contribution of each dimension.

| | Education | Health | | Mental Health | | Housing | Employment | Social network | Subjective poverty |
|---|---|---|---|---|---|---|---|---|---|
| | Years of schooling | Self-rated health | BMI | Anxiety | Stress | Living area per capita | Not working | Poor connection | Feeling poor |
| K = 1 | 0.269 | 0.019 | 0.097 | 0.031 | 0.016 | 0.050 | 0.249 | 0.114 | 0.155 |
| K = 2 | 0.270 | 0.021 | 0.083 | 0.033 | 0.018 | 0.052 | 0.236 | 0.114 | 0.172 |
| K = 3 | 0.243 | 0.027 | 0.068 | 0.040 | 0.021 | 0.054 | 0.222 | 0.129 | 0.194 |
| K = 4 | 0.216 | 0.039 | 0.064 | 0.059 | 0.036 | 0.057 | 0.182 | 0.149 | 0.197 |
| K = 5 | 0.186 | 0.039 | 0.054 | 0.064 | 0.050 | 0.079 | 0.165 | 0.150 | 0.186 |

(adjusted OR 31.52, 95% CI [13.15–75.54]). Those who were single, separated, divorced or widowed had a smaller association with poverty than those married or cohabiting (adjusted OR 0.71, 95% CI [0.52–0.98]. Being income poor (adjusted OR 5.09, 95% CI [2.07–12.51]) and deprived of necessities (adjusted OR 21.54, 95% CI [3.56–130.19]) were significantly associated with multidimensional poverty.

When k = 2, all predictors were significantly associated with poverty except marital status in the univariate model. Sex, age, and household size were significant risk factors in the multivariate model. Females showed a more prominent association with poverty than males (adjusted OR 2.57, 95% CI [1.91–3.45]). Compared with singletons, 2-person families were less associated with poverty (adjusted OR 0.42, 95% CI [0.22–0.78]). On the other hand, older adults were more at risk than those aged 18 to 40 when k = 3 (adjusted OR 9.43, 95% CI [6.01–14.79]) and k = 4 (adjusted OR 12.98, 95% CI [5.62–29.94]) in the multivariate models. More detailed results are shown in Table 6. Income poverty and deprivation of necessities were significant risk factors for multidimensional poverty for k = 2, 3, and 4 in all multivariate models. The adjusted OR of income poverty and deprived of necessities decreased when the cut-off increased.

### *3.3. Multidimensional poverty, income poverty and deprivation of necessities*

The association between multidimensional poverty, income poverty and deprivation of necessities was further investigated. Table 7 shows the prevalence of the income poverty and deprived of necessities rates for different cut-off (k) and the correlation coefficient between income poverty, deprivation of necessities and multidimensional poverty. Income poverty and deprivation of necessities were significantly correlated with

**Table 6.** Logistic regression models.

| | K = 1 | | K = 2 | | K = 3 | | K = 4 | |
|---|---|---|---|---|---|---|---|---|
| Variables | Univariate model Crude OR | Multivariate model AOR | Univariate model Crude OR | Multivariate model AOR | Univariate model Crude OR | Multivariate model AOR | Univariate model Crude OR | Multivariate model AOR |
| Gender (ref: male) | | | | | | | | |
| – Female | 1.33(1.04–1.71)* | 1.32(0.99–1.75) | 1.53(1.25–1.88)*** | 1.75(1.36–2.25)*** | 1.43(1.11–1.83)** | 1.49(1.1–2.02)* | 0.84(0.57–1.22) | 0.8(0.52–1.24) |
| Age (ref: 18 to 40) | | | | | | | | |
| – 41 to 59 | 2.46(1.87–3.24)*** | 2.16(1.57–2.97)*** | 2.5(1.95–3.21)*** | 2.57(1.91–3.45)*** | 2.81(1.96–4.03)*** | 3.3(2.16–5.04)*** | 6.1(2.86–13.01)*** | 6.23(2.78–13.97)*** |
| - ≥60 | 39.81(16.93–93.61)*** | 31.52(13.15–75.54)*** | 10.72(7.8–14.72)*** | 10.75(7.36–15.71)*** | 8.37(5.85–11.97)*** | 9.43(6.01–14.79)*** | 13.05(6.2–27.47)*** | 12.98(5.62–29.94)*** |
| Marital status (ref: Married/ cohabiting) | | | | | | | | |
| - Single/ separated/ divorced/ widowed | 0.64(0.5–0.83)** | 0.71(0.52–0.98)* | 0.95(0.77–1.17) | 0.95(0.71–1.27) | 1.24(0.97–1.58) | 1.22(0.85–1.75) | 1.05(0.71–1.53) | 1.15(0.65–2.02) |
| Household size (ref: 1-person) | | | | | | | | |
| – 2-person | 0.59(0.32–1.08) | 0.75(0.36–1.56) | 0.35(0.22–0.56)*** | 0.42(0.22–0.78)** | 0.33(0.21–0.51)*** | 0.57(0.31–1.04) | 0.39(0.2–0.74)*** | 0.81(0.35–1.87) |
| – 3-person | 0.45(0.26–0.79)** | 0.93(0.47–1.85) | 0.25(0.16–0.39)*** | 0.56(0.31–1.02) | 0.25(0.16–0.38)*** | 0.79(0.43–1.45) | 0.29(0.16–0.53)*** | 1.08(0.46–2.57) |
| – 4-person | 0.43(0.25–0.75)** | 1.12(0.57–2.2) | 0.25(0.16–0.39)*** | 0.79(0.43–1.43) | 0.22(0.15–0.33)*** | 1.03(0.55–1.92) | 0.3(0.17–0.54)*** | 1.83(0.73–4.57) |
| – 5-person or above | 0.66(0.36–1.21) | 1.62(0.79–3.34) | 0.34(0.21–0.54)*** | 0.95(0.51–1.78) | 0.35(0.23–0.54)*** | 1.37(0.71–2.65) | 0.49(0.27–0.89)*** | 2.44(0.96–6.22) |
| Income poverty (ref: Not poor) | | | | | | | | |
| – Income poor | 11.75(5–27.59)*** | 5.09(2.07–12.51)*** | 9.15(5.95–14.09)*** | 4.46(2.75–7.25)*** | 5.69(4.17–7.76)*** | 2.39(1.61–3.55)*** | 4.27(2.83–6.46)*** | 1.81(1.04–3.14)* |
| Deprivation of daily necessities (ref: Not deprived) | | | | | | | | |
| – deprived of daily necessities | 38.18(6.41–227.37)*** | 21.54(3.56–130.19)*** | 10.76(6.24–18.58)*** | 7.54(4.19–13.57)*** | 9.26(6.44–13.32)*** | 7.36(4.82–11.25)*** | 9.28(6.12–14.07)*** | 6.92(4.24–11.3)*** |

Note. Significance level, Odds ratio (OR), Adjusted odds ratio (AOR), and 95% confidence interval (CI). *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

**Table 7.** Comparison between income poverty, deprivation and multidimensional poverty.

| | Income poor | Deprived of necessities (deprivation item ≥ 2) |
|---|---|---|
| All | 14.7% | 10.5% |
| K = 1 | 18.1% (0.17**) | 13.2% (0.18**) |
| K = 2 | 25.5% (0.27**) | 18.5% (0.31**) |
| K = 3 | 35.3% (0.36**) | 30.6% (0.31**) |
| K = 4 | 38.2% (0.32**) | 43.4% (0.20**) |

Figures in () show the correlation coefficient with multidimensional poverty cut-off k;*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

**Table 8.** Poverty rates by permutations of dimensions.

| Multidimensionally poor | Income poor | Deprived (of necessities) | Prevalence (when K = 1) | Prevalence (when K = 2) | Prevalence (when K = 3) | Prevalence (when K = 4) |
|---|---|---|---|---|---|---|
| Yes | Yes | Yes | 5.3% | 4.9% | 3.6% | 1.6% |
| Yes | Yes | No | 9.0% | 8.0% | 4.3% | 1.4% |
| Yes | No | Yes | 5.2% | 4.6% | 3.4% | 1.8% |
| Yes | No | No | 59.4% | 33.1% | 11.1% | 3.1% |
| No | Yes | Yes | 0.1% | 0.4% | 1.7% | 3.7% |
| No | Yes | No | 0.3% | 1.3% | 5.1% | 7.9% |
| No | No | Yes | 0.0% | .6% | 1.9% | 3.4% |
| No | No | No | 20.7% | 47.0% | 69.0% | 77.0% |

multidimensional poverty in all cut-off k. On the other hand, the prevalence of income poverty and deprivation of necessities increased when cut-off k increased. For example, when k = 4, the income poverty rate was 38.2%, and the deprivation of necessities rate was 43.4%, much higher than the overall population (14.7% and 10.5%, respectively).

The overlap of the three types of poverty was examined (Table 8). The percentage of persons experiencing all three types of poverty was 5.3%, 4.9%, 3.6% and 1.6% when k = 1, 2, 3 or 4, respectively. These rates were much lower than the poverty rate with only one type of poverty, implying that the overlap of the three types of poverty was not significant. On the other hand, a certain proportion of the sample faced two of the three types of poverty. For example, when k = 2, 8.0% of the sample faced multidimensional poverty and income poverty but were not deprived of necessities, and 4.6% of the sample faced multidimensional poverty and were deprived of necessities but not income poor. The results demonstrated that the three types of poverty correlated but did not significantly overlap; they measured different characteristics of suffering.

## 4. Discussion and conclusion

The income approach has dominated the conceptualization and measurement of poverty for several decades, although scholars have proposed various alternatives such as deprivation and capabilities poverty (Laderchi et al., 2003; Sen, 1999; Townsend, 1979). This study applied the AF approach to examine multidimensional poverty in Hong Kong using a random population sample. This study has overcome the limitations of the income approach in poverty measurement, which overlooks other crucial perspectives of human well-being. Instead of income alone, seven key dimensions, education, employment, health, mental health, housing social network,

and subjective poverty, were included in the poverty analysis, revealing the multi-faceted nature of poverty. Using capability approach and AF method offers several advantages over traditional income-based or consumption-based measures. Firstly, it captures multidimensional poverty by considering various dimensions of well-being beyond income, providing a comprehensive understanding of poverty and specific deprivations individuals may face. Secondly, it includes non-monetary aspects like mental health and social network, offering a holistic understanding of poverty and highlighting areas for targeted interventions. Lastly, it complements existing measures, providing additional information to inform policy decisions and poverty reduction efforts.Previous poverty studies using the AF method have commonly focused on low-income regions worldwide, such as Africa and South America (Maduekwe et al., 2020; Omotoso & Koch, 2018; Tonon & de la Vega, 2016). This study is one of few to apply the AF method in a high-income context. Some dimensions commonly used in low-income regions include no clean water, no electricity, and no flush toilet. The prevalence of such conditions is rare in high-income regions such as Hong Kong. Instead, this study incorporated other vital dimensions of poverty, such as bad mental health, confined living area, and poor social network, crucial perspectives of well-being in modern cities (Bellani & D'Ambrosio, 2011; Chan et al., 2020; Hwang & Nam, 2020). The AF method can be adapted and applied to the Hong Kong context. Although Hong Kong is a high-income region, it still faces significant poverty and social inequality. Traditional income-based measures may not capture the full extent of poverty experienced by individuals and families, particularly in relation to non-monetary dimensions such as social relationship, health, and housing. The AF method's focus on multiple dimensions aligns well with the need to understand and address these complex poverty dynamics. For example, in Hong Kong, housing problems are critical issues that significantly impact individuals' well-being. By including housing as a specific dimension based on local conditions, we can capture the multidimensional nature of poverty more accurately. Moreover, the AF method offers flexibility in terms of its dimension selection. This allows for localized contextualization, enabling the measurement framework to the specific characteristics and priorities of the Hong Kong population.

Moreover, the application of the AF method also enabled identification of those at risk of multidimensional poverty from the logistic regression models. Females, older adults and singletons were three groups at risk of multidimensional poverty with various poverty cut-offs. The proportion of women not in employment was considerably higher than males. One of the reasons for this is that women retain greater responsibility for family care in Chinese culture and could not work to earn a living by themselves (Chan & Chui, 2011). People aged 60 or above suffered from different dimensions of poverty. For instance, a large proportion of older adults received less than 12 years of schooling because they did not have access to free education in their childhood and have not directly benefited from the substantial enhancements in education provision and financial support in recent years. Moreover, older adults had poorer health and mental health than younger people, highlighting their exposure to low or no income and other dimensions of poverty such as health and social network. Singletons experienced the highest prevalence of subjective poverty. This result contrasts with previous studies in which families with more members were more likely to feel poor because they needed more

resources for children's and other family members' living expenses (Baldini et al., 2018; Kaya, 2014; Peng et al., 2020). This association between subjective poverty and family size merits further research.

Another key finding of this study was the relationship between multidimensional poverty, income poverty and deprivation of necessities. There was little overlap between people suffering from these different types of poverty, echoing Bradshaw and Finch's (2003) earlier finding of little overlap between income poverty, deprivation and subjective poverty. This study reinforced such findings and highlighted that these three types of poverty were correlated but distinct. Moreover, deprivation of necessities was found to be a more significant predictor of multidimensional poverty than income poverty. In some previous studies in Hong Kong, deprivation of necessities differed from income poverty and was a crucial predictor of health and mental health (Chung et al., 2018, 2018). This study supports these earlier findings, highlighting the importance of deprivation of necessities. Moreover, the relatively large odds ratios between the dimensions of poverty and deprivation of daily necessities suggests that individuals experiencing deprived of daily necessities are more likely to be multidimensional poor. The findings highlight that individuals experiencing deprivation of daily necessities may face multiple challenges and lack access to essential resources, perpetuating their poverty status across different dimensions of well-being. For those who are deprived, their limited resources and opportunities hinder their ability to achieve a satisfactory level in other dimensions of poverty, resulting in being poor across various aspects of life. This interconnectedness reinforces the cycle of poverty, as individuals struggle to break free from the constraints imposed by their deprivation and improve their overall well-being. Understanding this dynamic is crucial for policymakers and organizations working to alleviate poverty as it emphasizes the need for comprehensive interventions that address various dimensions of poverty simultaneously.

Furthermore, the prevalence of income poverty and deprivation of necessities at the poverty cut-off $k \geq 1$ is higher than in the overall population. For example, the income poverty rate was 25.5%, and the rate of deprivation of necessities was 18.5% when $k = 2$. In addition, 33.1% of the population suffered from multidimensional poverty but were not income poor or deprived of necessities. This may imply that the income poverty measurement, even supplemented by the deprivation of necessities measurement, underestimates the size of Hong Kong's poor population.

These new findings regarding multidimensional poverty analysis provide crucial information for the future direction of anti-poverty strategies in Hong Kong. Although monetary support undoubtedly remains critical for low-income families, poverty relief measures should not solely focus on a money-giving approach. The study shows that those suffering from multidimensional poverty differ from those experiencing income poverty. Anti-poverty policies should also focus on other key dimensions of poverty, such as mental health, housing, and social network (Chan et al., 2023). Although various social policies concern these poverty dimensions, they are not commonly discussed in the anti-poverty policy agenda. The choice of poverty dimensions enhances our understanding of the nature of poverty and ideas to eradicate it (Kakwani & Silber, 2008; Kwadzo, 2015; Orshansky, 1969). The government can help the underprivileged more comprehensively by

broadening the concept of poverty. It is recommended to apply a more comprehensive anti-poverty strategy, such as the Graduation Approach (Marston & Grady, 2014), which takes a multidimensional and intensive approach to address poverty effectively. Moreover, applying the AF method identifies those at risk of multidimensional poverty. Policymakers should devote more attention and resources to reducing poverty among women, older people and singletons. The social and economic environment has undergone a transformation in Hong Kong in recent years. The changes may have an impact on the relationship between risk factors and multidimensional poverty, it remains a question that requires further investigation. Nevertheless, the use of older data allows us to establish a theoretical base and understand the long-term relationships among risk factors and multidimensional poverty. These dimensions and risk factors have demonstrated significant associations with poverty over time, providing a basis for their continued relevance.

This study has some significant strengths. The data were based on a random sample of the Hong Kong population, and the results can be generalized to the multidimensional poverty situation in Hong Kong. Another strength is that the data also provided validated measures of income poverty and deprivation of necessities, enabling comparative analysis to be conducted and discussed. On the other hand, the study has several limitations. First, the data were cross-sectional and had limited power in explaining the causal relationship between multidimensional poverty and the predictive variables. Second, the measurement of poverty dimensions based on binary variables may have limited the intensity of deprivation in such dimensions.

Nevertheless, multidimensional poverty intensity could be calculated using the AF method. Third, some variables were self-reported, such as self-rated health and subjective poverty. However, such subjective perspectives are also crucial in poverty measurement. Fourth, the dataset may not have reflected the current local poverty situation, which may have worsened during the COVID-19 pandemic. Future research is needed to examine the evolving poverty dynamics. Nevertheless, the dataset was a random sample containing rich data about different poverty dimensions, vital for assessing multidimensional poverty in Hong Kong. Fifth, while efforts were made to handle the missing cases, which less than 5% of the sample, the potential impact on the study results and conclusions cannot be completely ruled out. The possibility of bias, reduced statistical power, and limited generalizability should be considered when interpreting the findings.

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