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Research paper

Added socioeconomic burden of non-communicable disease on HIV/AIDS affected households in the Asia Pacific region: A systematic review

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ABSTRACT

Background: HIV/AIDS causes significant socioeconomic burden to affected households and individuals, which is exacerbated by non-communicable diseases (NCDs). The Asia Pacific Region (APR) comprises about 60% of the global population and has been significantly affected by HIV/AIDS with 5.8 million after Sub-Saharan Africa in 2019. We investigated socioeconomic impacts of HIV/AIDS alone and the added burden of NCDs on HIV-affected households (HIV-HHs) and individuals in the APR.

Method: We searched multiple databases for studies published in English over 30 years on socioeconomic impact of HIV/AIDS alone and HIV/AIDS with NCDs on affected households or individuals in APR. Findings were synthesised across six domains: employment, health-related expenditure, non-health expenditure, strategies for coping with household liabilities, food security, and social protection.

Findings: HIV-HHs had a significantly higher socioeconomic burden compared to Non-HIV households. Total household expenditure was lower in HIV-HHs but with higher expenditure on health services. HIV-HHs experienced more absenteeism, lower wages, higher unemployment, and higher food insecurity. There is a paucity of evidence on the added burden of NCDs on HIV-HHs with only a single study from Myanmar.

Interpretation: Understanding the socioeconomic impact of HIV/AIDS with and without NCD is important. The evidence indicates that HIV-HHs in APR suffer from a significantly higher socioeconomic burden than Non-HIV-HHs. However, evidence on the additional burden of NCDs remains scarce and more studies are needed to understand the joint socioeconomic impact of HIV/AIDS and NCDs on affected households.

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Research in context

Evidence before this study

Research on the added socioeconomic burden of NCDs on HIV-HHs in the APR is limited and has not been systematically peer reviewed despite the WHO SEA region having

the second largest HIV/AIDS burden [4]. To our knowledge, a comprehensive systematic review of the socioeconomic burden of HIV/AIDS on HIV-HH in the APR has not been previously published, nor the added socioeconomic burden of NCDs on HIV-HHs in the APR or any other region.

Added value of this study

This study provides a comprehensive and systematic review in this area and highlights the socioeconomic burden across six commonly reported domains: health related

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expenditure, non-health related expenditure, employment, household liability, food security and social protection/social support measures. While this review systematically maps the socioeconomic impact of HIV/AIDS on households/individuals, the findings revealed a gap in evidence regarding the added burden of NCDs on HIV affected households.

Implications of all the available evidence

This is the first systematic review exploring the socioeconomic burden of HIV/AIDS and the added socioeconomic burden of NCDs on HIV-HHs in the APR. The socioeconomic burden of HIV/AIDS alone showed that the burden on HIV-HHs is much higher than non-HIV-HHs. Data for HIV-HHs affected by both HIV/AIDS and NCDs comes from only one Myanmar study. Therefore, the lack of evidence on the added burden of NCDs on HIV-HHs highlights the need for further research in this area.

Introduction

Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) continues to be a global public health challenge with increased numbers of people living with HIV/AIDS (PLHIV) [1]. The Asia Pacific region (APR), which includes World Health Organization (WHO)'s South East Asia (SEA) and Western Pacific regions, are home to about 60% of the global population [2] and have more PLHIV (5.8 million in 2019) than any other region after Sub-Saharan Africa [3]. According to WHO regional definitions, the SEA region alone comprised 3.8 million PLHIV in 2018, approximately 10% of the global HIV/AIDS affected population [4].

Improved Antiretroviral Therapy (ART) access along with global public health awareness has resulted in HIV infection transitioning from being a deadly infectious disease to a manageable chronic disease [5]. ART treatments improve life expectancy of PLHIV [5], but ageing is a major risk for non-communicable diseases (NCD) [6,7]. In addition, evidence suggests that HIV/AIDS increases the risk of NCDs such as cardiovascular diseases and immunodeficiency complications [8].

HIV/AIDS and NCDs each have remarkable negative socioeconomic impacts for affected households [9], and HIV/AIDS combined with NCDs present a risk to socioeconomic wellbeing [10]. The increasing number of PLHIV implies that households in the most affected regions will be hardest hit by this double-burden. However systematic review evidence on the impacts of both HIV/AIDS and NCD across socioeconomic domains within APR is quite limited. The added burden from NCDs on HIV affected households (HIV-HHs) and individuals remains complex and poorly understood [10] despite PLHIV now living longer and hence increasingly at risk of developing other chronic conditions.

Since 2005, the United Nations Development Programme (UNDP) commissioned a series of studies investigating the social and economic impact of HIV on PLHIV and their households across the APR. The first commissioned report covered India, Cambodia, China, Vietnam, and Indonesia [11], with a later study investigating the impact of HIV on households in Myanmar [12]. It was this latter study from Myanmar published by the UNDP that suggested that the socioeconomic impact of households impacted by HIV might differ depending on whether the household was affected by both NCDs and HIV [12].

Based on the UNDP commissioned studies of the APR, we were interested in understanding the socio-economic impact on a region broader than that covered by the WHO South East Asia Regional Office (SEARO). The WHO SEARO definition misses countries such as Cambodia, Laos, Philippines, and Vietnam identified as having a high socio-economic burden attributable to HIV in the UNDP reports. Under the WHO, these countries are covered by the West-

ern Pacific Regional Office (WPRO), which also includes countries where the burden of HIV is very different (Australia, New Zealand, and Japan). By combining WHO SEARO and the World Bank's East Asia Pacific region (excluding Pacific Islands, and PNG) [13], we were able to include countries impacted by HIV/AIDS in the Asia Pacific Region identified by the UNDP.

This systematic review aims to investigate the evidence of the socioeconomic burden of HIV/AIDS compared to non-HIV/AIDS affected households and individuals, and the added socioeconomic burden of NCDs on HIV/AIDS affected households and individuals in the APR.

Methods

Search strategy and selection criteria

We conducted a systematic review following PRISMA guidelines, 2015 [14] and registered the study with PROSPERO (CRD42018103318) [15]. We searched online databases PubMed, EMBASE, Web of Science, EBSCOhost (MEDLINE Complete, CINAHL Complete, EconLit, and PsycINFO), Google Advanced Search, Google, and reference lists of the included articles. The search incorporated terms related to socioeconomic domains, NCD(s) and countries in the APR (Appendix 1).

We included studies on socioeconomic burden related to HIV/AIDS alone or HIV/AIDS plus NCD in the APR from an individual and/or household perspective. The search was restricted to studies published in English from January 1990 to September 2020. A preliminary search suggested that it was unlikely that studies would be identified using higher quality longitudinal studies. Therefore, we did not limit the search to any study design. Studies that did not meet the above inclusion criteria or had insufficient information (abstracts, letters to editor, commentaries) were excluded.

Study location was restricted to the UNDP's Asia Pacific Region which included: Bangladesh, Bhutan, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste, Cambodia, China, Korea, Lao PDR, Malaysia, Mongolia, Philippines, Singapore, and Vietnam.

Socioeconomic burden was determined from six socioeconomic domains which included health expenditure, non-health expenditure, employment, strategies for coping with household liabilities, food security and social protection based on the frameworks used in UNDP socioeconomic impact studies [11,12] in the APR.

Two reviewers (JAO and SBM) developed the systematic review strategy. Two review teams (JAO/ SWAD and SBM/ RS) first screened titles and abstracts independently. These papers were then divided equally between the two review teams for full-text screening. Any disagreement were discussed with other authors of this review (BC-field expert and JW- senior health economist) to reach consensus.

Data analysis

Two reviewers (SWAD and IM) extracted data independently: country, study aim, population characteristics, study period, setting, study design, sample size, key findings for each of the six socioeconomic domains from both household and individual perspectives, and conclusions.

We assessed risk of bias and the review team discussed and resolved any discrepancies in overall quality rating using the Newcastle-Ottawa Scale (NCO) [16,17] for non-randomized studies including case-control and cohort studies. The scale has three domains and uses a 'star system' scoring method to rate quality as GOOD, FAIR or POOR (Appendix 2) [16]. The "Follow-up criteria" in

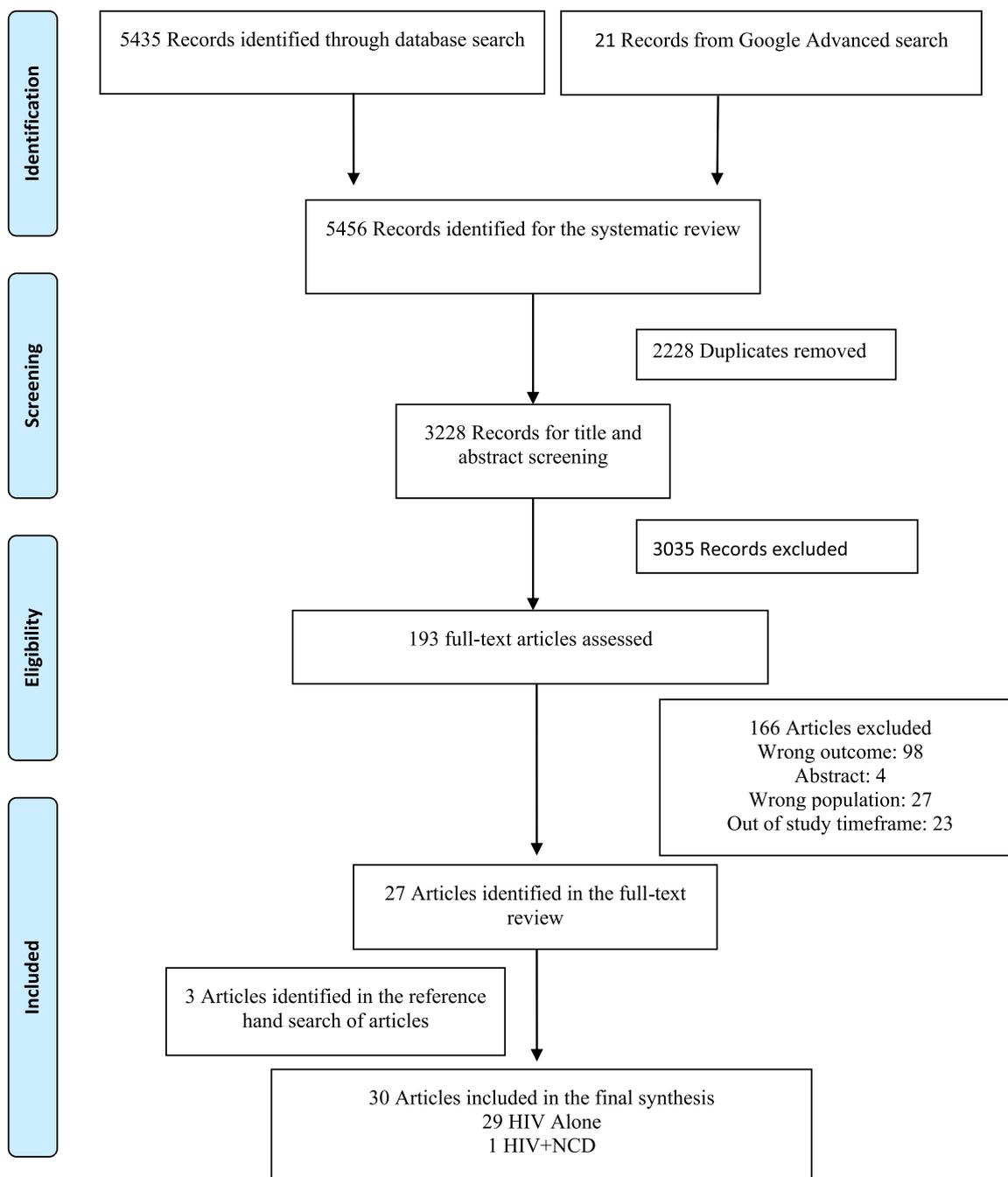


Fig. 1. Consort chart.

the outcome domain were not applicable to cross sectional studies. Therefore, the scoring of the outcome domain was modified by reducing one star point. Studies with poor quality were rated as having a high risk of bias while good quality studies were rated as low risk of bias. Two pairs of reviewers (IM/ SWAD and SBM/ JAO) conducted the quality assessment.

We performed a synthesis of the evidence across each of the six socioeconomic domains. Where monetary values were not reported a qualitative synthesis of the evidence was undertaken for the socioeconomic domain. Where monetary values were reported for the socioeconomic domain they were converted to 2019 US dollars using web-based Campbell & Cochrane Economics Methods Group and Evidence for Policy and Practice Information Centres' cost converter created by the International Monetary Fund[18] based on Purchasing Power Parity. If in-

come or expenses were reported per year or for a specific period of the year, we calculated the mean or median monthly income or expense per month assuming income or expenditure was earned/spent proportionately (pro rata income/expense). Expenses reported as a percentage of income were calculated to report the expense per month in monetary terms. Comparison of data was mainly conducted at the household level as data on individual level was limited due to no control arm in the included studies. Individual level comparisons are flagged where included.

Role of the funding source

Deakin University School of Health and Social Development grant and a Deakin University Career Continuity grant provided fi-

Table 1
General study characteristics.

Authors and year	Country	Study period	Perspective	Socioeconomic domain	Study population characteristics	Study setting	Study design/ Methodology	Sample size (n)	Control/ Comparison
Socioeconomic burden of HIV/AIDS households									
Batteh et al. [19], 2008	Cambodia	2003 - 2004	HH	Health-related expenditure; Employment; Strategies for coping with household liabilities; Food security	PLHIV and their children	Community setting	Case control	N = 500 (HIV); N = 500 (Non-HIV)	Non-HIV
Dasgupta et al. [40], 2016	India	2015	HH	Food security; Strategies for coping with household liabilities	ART patients aged 18- 64 years	Healthcare setting	Cross sectional	N = 173	No control arm
Johns et al. [41], 2017	Vietnam	2015	I	Health-related expenditure; Non-health expenditure	ART patients aged over 18 years	Healthcare facilities	Cross sectional	N = 843	No control arm
Ghailan et al. [22], 2010	Malaysia	2007- 2008	HH	Health-related expenditure; Employment	PLHIV aged 18 to 56 years	Healthcare setting	Cross sectional	N = 300	No control arm
Kumar & Sathiyasekaran [42], 2017	India	2010	I	Health related expenditure; Employment	Adult patients who have completed one month of 2nd line ART	Healthcare setting	Cross sectional	N = 334	No control arm
Moon et al. [36], 2008	China	2005 - 2006	I	Health-related expenditure	PLHIV	Healthcare setting	Prospective Cohort	N = 7	No control arm
Nguyen et al. [25], 2014	Vietnam	2011	HH	Health- related expenditure	ART patients	Healthcare setting	Cross sectional	N = 315	No control arm
Nomoto et al. [26], 2013	Cambodia	2008	HH	Health-related expenditure; Non-health expenditure; Employment; Strategies for coping with household liabilities	HIV positive and negative married men and women aged 18–59 years	Healthcare setting	Cross sectional	N = 285 (HIV); N = 285 (Non-HIV)	Non-HIV
Poudel et al. [29], 2017	Nepal	2011	HH	Health-related expenditure; Employment	PLHIV aged over 18 diagnosed HIV-positive more than a month prior to survey	Healthcare setting	Cross sectional	N = 415	No control arm
Riyarto et al. [43], 2010	Indonesia	2006	HH + I	Health-related expenditure; Strategies for coping with household liabilities	PLHIV	Healthcare setting	Cross sectional	N = 353	No control arm
Thirumurthy et al. [32], 2011	India	2005 - 2007	HH	Employment	HIV-HHs	Healthcare setting	Cohort	N = 1238; N = 723 (pre-ART)	Pre-ART patients
Toth et al. [44], 2018	Cambodia	2016	I	Social protection	Adolescents aged 15–17 years receiving treatment and care services	Healthcare setting	Cross sectional	N = 328	No control arm

(continued on next page)

Table 1 (continued)

Authors and year	Country	Study period	Perspective	Socioeconomic domain	Study population characteristics	Study setting	Study design/ Methodology	Sample size (n)	Control/ Comparison
Tran et al. [33], 2012	Vietnam	2012	HH	Health-related expenditure; Non-health expenditure	PLHIV who registered for care or taking ART	Healthcare setting	Cross sectional	N = 1016	No control arm
Zhang et al. [38], 2012	China	2006 - 2007	HH	Employment	HIV-HHs	Community and Healthcare setting	Cross sectional	N = 866	No control arm
Pitayanon et al. [28], 1997	Thailand	1992 - 1993	HH	Health- related expenditure; Employment; Strategies for coping with household liabilities	HHs with recent HIV/AIDS related deaths of working age	Healthcare setting	Cross sectional	N = 116 (HHs with HIV/AIDS death)	N = 100 (HHs with HIV/AIDS related death); N = 108 (HHs with no deaths)
Ji et al. [23], 2007	China	2005- 2006	HH	Employment	local health workers, local school teachers, village leaders, PLHIV, and caregivers of children from HIV-HHs	Healthcare setting	Cross sectional	N = 154	No control arm
Taraphdar et al. [37], 2011	India	2008	HH	Employment	Newly diagnosed PLHIV attending a community centre and all indoor HIV/AIDS patients	Healthcare setting	Cross sectional	N = 292	No control arm
Pradhan et al. [45], 2006	India	2004 - 2005	HH	Health-related expenditure; Non-health expenditure; Employment; Strategies for coping with household liabilities; Social protection	HIV-HHs and Non-HIV HHs	Community setting	Cross sectional	N = 2068 (HIV); N = 6224 (Non-HIV)	Non-HIV
Pradhan & Sundar. [30], 2006	India	2004 - 2005	HH	Health-related expenditure; Non-health expenditure; Strategies for coping with household liabilities	HIV-HHs and Non-HIV HHs	Community setting	Cross sectional	N = 2068 (HIV); N = 6224 (Non-HIV)	Non-HIV
Elsland et al. [21], 2011	India	2008	HH	Food security	HIV-HHs with a child	Community setting	Cross sectional	N = 132	No control arm
Cercone & Pinder [35], 2010	Cambodia	2009 - 2010	HH	Health-related expenditure; Non-health expenditure; Employment; Strategies for coping with household liabilities; Food security; Social protection	HIV-HHs	Healthcare settings	Cross sectional	N = 2623 (HIV); N = 1349 (Non-HIV)	Non-HIV
Phong at al. [27], 2005	Vietnam	2003	HH	Health- related expenditure; Employment; Strategies for coping with household liabilities	HIV-HHs	Community settings	Cross sectional	N = 125 (HIV-HH); N = 129 (I)	No control arm
Kangmai et al. [39], 2002	China	2001 - 2002	HH + I	Health-related expenditure; Employment	HIV-HHs	Community settings	Cross sectional	NA	NA

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Table 1 (continued)

Authors and year	Country	Study period	Perspective	Socioeconomic domain	Study population characteristics	Study setting	Study design/ Methodology	Sample size (n)	Control/ Comparison
Kangmai et al. [24], 2009	China	2008 - 2008	HH+ I	Health-related expenditure; Non-health expenditure; Employment; Strategies for coping with household liabilities; Social protection	HIV-HHs	Community settings	Cross sectional	N = 931 (HIV); N = 995 (Non-HIV)	No control arm
Puri et al. [31], 2008	Nepal	2006	HH	Health-related expenditure	HIV-HHs	Community settings	Cross sectional	N = 167	No control arm
Ajithkumar et al. [46], 2007	India	2004 - 2005	I	Employment	PLHIV aged ≥ 20 years at the end of 10 months of ART	Healthcare setting	Prospective Cohort	N = 104	No control arm
Duraisamy et al. [20], 2006	India	2001 - 2002	HH	Health-related expenditure; Employment; Strategies for coping with household liabilities	PLHIV aged ≥ 18 years	Healthcare setting	Prospective Cohort	N = 153	No control arm
Cercone & Pinder [11], 2011	Indonesia	2009	HH	Health-related expenditure; Non-health expenditure; Employment; Strategies for coping with household liabilities	HIV-HHs	Community setting	Cross sectional	N = 996 (HIV); N = 996 (Non-HIV)	No control arm
UNDP [34], 2009	Vietnam	2008	HH	Health-related expenditure; Non-health expenditure; Strategies for coping with household liabilities; Food security; Employment; Social Protection	HIV-HHs	Community setting	Cross sectional	N = 453 (HIV); N = 453 (Non-HIV)	No control arm
Cercone et al. [12], 2016	Myanmar	2014	HH	Health-related expenditure; Non-health expenditure; Employment; Household liabilities; Food security	PLHIV on ART	Healthcare setting	Cross sectional	N = 1256 (HIV); N = 1256 (Non-HIV)	Non-HIV + NCD; Non-HIV + Non-NCD; HIV + NCD

Note: HH – Households

I- Individual

ART - Antiretroviral therapy.

CD - NCD- Non communicable disease.

NA- Not Available information.

Nil- No control group.

PLHIV-People Living with HIV/AIDS Socioeconomic domains.

financial support for this study. The funding source was not involved in the systematic review in any other way.

Results

Of 5456 studies screened, 30 studies met the inclusion criteria for the final synthesis (Fig. 1). Out of the 30 studies, 29 (97%) studies considered impacts of HIV alone and only one study explored the impact of HIV/AIDS and NCDs. Table 1 provides the summary details of the included studies.

Twenty-three out of 30 papers (77%) reported income levels for the study population; from these, 16 studies (53%) [11,19-34] reported household level income (mainly self-reported) and seven studies (23%) [12,20,33,35-38] reported income per capita in households. Average monthly household income (Table 2) was reportedly lower in HIV-HHs than Non-HIV-HHs across Cambodia [19], China [24], India [30], and Myanmar [12], with the smallest income

difference between HIV-HHs and Non-HIV-HHs reported from India (US\$15•41) [24,30], while a significant difference was reported from China (US\$251•40) [24]. Indonesia was an exception with a single study reporting higher income in HIV-HHs (US\$375•75) compared to Non-HIV-HHs (US\$331•89) [11]. A diagnosis of HIV led to a self-reported decline in income in HIV-HHs by 23% in Cambodia and 53•8% in India [19,37]. Most of HIV-HHs were low-income families and a considerable proportion of them were below the poverty line compared to Non-HIV-HHs [11,20,24,35,39].

Total monthly household expenditure (Table 2; see Appendix 3 for more information) for all goods and services was lower in HIV-HHs than Non-HIV-HHs across Cambodia, Vietnam, India and China [12,19,24,30,34]. Expenditure was higher in both HIV-HHs and Non-HIV-HHs than their reported household income in Cambodia, Nepal and China studies, with the difference significant [19,24,31].

Table 2

Monthly income, expenditure and total health related expenditure at household level (US\$ 2019).

This table has summarized income, expenditure and health related expenditure results for each country. Outliers were excluded. When there were several studies for one country, the mean and median of the combined studies was considered for those countries.

Country	Cambodia		Indonesia		China		India		Myanmar		Nepal	Vietnam
	HIV	Non-HIV	HIV	Non-HIV	HIV	Non-HIV	HIV	Non-HIV	HIV	Non-HIV	HIV	HIV
Household income												
Mean	53•36[19]	102•67[19]	375•75[11]	331•89[11]	338•76[24]	590•16[24]	444•06[30]	459•47[30]	69•35[12]	72•87[12]	121•32[29]	171•75[25]
								1109•02[20]*			182•11[31]*	389•27[33]
Median	89•36[26]	151•92[26]	..	..	..	..	..	..	..	..	..	..
		232•71[35]*										
		177•77[35]*										
Household expense												
Mean	100•92[19]	109•68[19]	..	..	643•56[24]	707•95[24]	433•23[30]	415•80[30]	330•39[12]	337•04[12]	247•56[31]	319•00[33]
Median	87•8[26]	133•45[26]*	..	..	..	..	..	..	..	..	..	..
Health related expenditure												
Mean	17•77[19]	9•38[19]	31•84[11]	12•76[43]	752•84[39]	..	311•48[20]	..	23•10[12]	12•40[12]	23•42[29]	14•57[25]
			71•88[43]*									37•08[33]*
Median	50•04[26]	59•58–83•41[26]**	..	..	..	..	..	..	..	..	..	..

Note: *lowest and highest mean/median amongst the country-based studies.

** mean/median range reported in a single study.

The study-specific and summarised quality assessment of studies is shown in Appendix 8. Eight studies had a low risk of bias (Good quality), 12 had moderate risk of bias (Fair quality) and 10 studies had high risk of bias (poor quality). We did not exclude poor quality studies due to lack of data for each country in the Asia Pacific region.

Health-related expenditure

The reported components of health-related expenditure due to HIV/AIDS were not consistent across studies, which included direct health service expenditure (pharmaceutical, medical, hospitalisation and other disease related costs) and direct non-health service expenditure (mainly transportation and funeral costs). Most of the papers captured healthcare expenditure by asking participants about these cost components. Total monthly out-of-pocket health expenditure related to HIV at the household level ranged from a minimum of US\$17•77 (33% of household income) in Cambodia[19] to US\$752•84 (222% of household income) in China [39]. There were large differences in out-of-pocket health expenditure between HIV-HHs and Non-HIV-HHs in most countries, for example, in HIV-HHs in Cambodia and Indonesia out-of-pocket health expenditure was two and six times higher than Non-HIV-HHs respectively (Table 2).

Direct health service expenditure was reportedly higher in HIV-HHs than Non-HIV-HHs[19,31,34] (Table 3). Average household monthly medical expenditure in HIV-HHs ranged from US\$14•31 (12% of household income) in Nepal[29] (which only reported on HIV-related medical costs including treatment, consultation, medicine and diagnostic costs) to US\$279•91 (25% of household income) in India [20]. Direct non-health service expenditure related to HIV/AIDS care ranged from US\$4•32 (transport) in Nepal[29] to US\$7•07 (transportation plus accommodation) in Indonesia [43]. The study from Indonesia[43] highlighted increasing transportation cost due to the long travel distance to HIV facilities. Studies also recorded HIV-related funeral cost as a burden for HIV-HHs [19,26,27].

HIV-HHs with NCD spent 50% (average of US\$ 32•86 per month) of their income to fulfil their health care needs compared with 10% (average of US\$ 9•93 per month) for Non-HIV HHs without NCD [12]. In the Myanmar study HIV-HH without NCD experienced a lower level of health expenditure compared to Non-HIV-HH without NCD (average of US\$ 20•91 per month for HIV-HHs without NCD and US\$ 22•21 per month for Non-HIV-HHs with NCD, accounting for 30% of their household income). Catastrophic health expenditure (>40% of non-food expenditure) was reported in 13.9% of HIV-HHs with NCD compared to 10.3% for HIV-HHs without NCD. The joint burden of HIV and NCDs on HHs was high; the highest out-of-pocket healthcare cost (US\$ 20.91 per month) was incurred by HIV-HHs with NCD, and the lowest (US\$ 9.71 per month) was reported for Non-HIV-HHs without NCD. At individual level, PLHIV who had a NCD were reported to have substantially higher healthcare costs (more than 8 times) than PLHIV without NCD (Appendix 3) [12].

Non-health related expenditure

Studies explored various components of non-health expenditure such as food, housing, utilities, transportation, education and other miscellaneous expenses. In Cambodia [35], China [24], Vietnam [34], and Myanmar [12], HIV-HHs spent less on utilities, food, education, housing and other expenses compared to Non-HIV-HHs. In contrast, a study in India showed HIV-HHs spent more on housing than Non-HIV-HHs [30]. Widowed HIV-HHs in India spent less than other HIV-HHs on utilities, food, housing, and other expenses except for education where the widowed HIV-HH spent more (Appendix 4) [30].

Employment

Only one study from Cambodia compared unemployment and absenteeism between HIV-HHs and Non-HIV-HHs. Unemployment was 77% and 54% for HIV-HHs and Non-HIV-HHs respectively; similarly, absenteeism was 2•65 and 0•67 days respectively. The unemployment rate in HIV-HHs ranged from 21%[38] to 41%[19] across

Table 3
Monthly health expenditure at household level (US\$ 2019).

Country	Cambodia		Indonesia		China		India	Nepal
	HIV	Non-HIV	HIV	Non-HIV	HIV	Non-HIV	HIV	HIV
Direct Health Services expenditure								
Mean	..	..	67•64[43]	14•50[43]	114•19[24]	56•92[24]	279•91[20]	14•31[29]
Median	14•30[26] - 68•97[35]; 00•00-71•49[26]**	59•58[26] - 80•66[35]; 11•92-175•16[26]**	..	..	..	..	..	..
Mean pharmaceutical cost	..	..	26•71[43]	1•02[43]	..	..	..	4•80[29]
Mean medical examination cost	..	..	7•39[43]	1•79[43]	..	..	..	7•55[29]
Mean hospitalization cost	..	..	..	..	..	..	..	..
Outpatient	10•97[35]	15•58[35]	..	..	..	..	..	..
Inpatient	95•85[35]	144•27[35]	..	..	..	..	..	..
Mean other medical costs	..	..	33•56[43]	9•03[43]	..	..	..	1•94[29]
Direct non-health services expenditure								
Transportation								
Mean	..	..	7•07[43]	1•02[43]	..	..	..	4•32[29]
Median	35•74[26] - 53•77[35]*	23•83 ²⁶ - 56•11[35]*	..	..	..	..	..	..
Mean other costs	..	..	..	..	..	..	..	4•78[29]
Mean funeral costs	357•47[19]	..	..	..	..	..	..	..

Note: *lowest and highest mean/median amongst the country-based studies.

** mean/median range reported in a single study.

countries. Absenteeism due to HIV varied from one day[42] to 14 days per month in India[37], and employability was shown to be negatively impacted upon the diagnosis of HIV for HIV-affected as well as family members[24] (Table 4; See Appendix 5 for more information). Two studies from India reported that Antiretroviral therapy (ART) led to increased employability by 47% [46] and increased income level by 25% in HIV-HHs [32].

Strategies for coping with household liabilities

Financial strategies within HIV-HHs to manage household liabilities included selling assets, borrowing money, use of savings, receiving donations, spending less on health expenditure for other family members and spending less on leisure activities (Table 4; in detail in Appendix 6) [11,19,27,34,35,40,43]. More HIV-HHs sold assets than Non-HIV-HHs, ranging from 5•7% in China to 34•4% more in Cambodia [19,24]. Similarly, more HIV-HHs borrowed money than Non-HIV-HHs with differences between groups ranging from 10% in Indonesia to 19% in Cambodia [19,43]. In general, the most common methods of borrowing for HIV-HHs was a loan from a financial institution, friends or relatives [11,27,40]. In Cambodia, more HIV-HHs reported using savings than Non-HIV-HHs to pay for household liabilities whereas in Thailand, China and Vietnam more Non-HIV-HHs reported to have used savings than HIV-HHs [19,24,28,34].

Food security

A Cambodian study [19] reported more HIV-HHs (69•4%) spent less on food compared to Non-HIV-HHs (52•6%) (Table 4; see Appendix 6 for more information). According to Dasgupta and colleagues [40], nearly 50% of HIV-HHs were food insecure in India. Later stages of HIV, low education, being a female and lower socioeconomic status were strongly linked with increased food insecurity [40].

In regards to added burden from NCDs, the Myanmar report indicated that 6•6% of HIV individuals with NCDs and 6•4% of HIV individuals without any NCDs were reportedly hungry or had not eaten enough in the 12 months prior to the survey due to limited food supply [12].

Social protection

A number of studies covered social protection/social support [24,30,34,35,44], Table 5 (in detail in Appendix 7) gives details of the various types of social support received by HIV-HHs [34,44]. The sources of support included government, community, non-governmental organisations (NGO), friends and families [30,34,35]. In general, more HIV-HHs received support from NGOs compared to Non-HIV-HHs. Family and friends support was lower for HIV-HHs than Non-HIV-HHs.

Discussion

We found that HIV/AIDS is associated with much higher expenditure and lower income than Non-HIV-HHs in the APR which is consistent with causal evidence from other settings [47-49]. Our findings indicate that average monthly household income was lower in HIV-HHs than Non-HIV-HHs and income fell on diagnosis of HIV. Our findings are consistent with previous studies, which highlighted the financial burden of HIV-HHs [29,50,51]. Furthermore, total expenditure in HIV-HHs was lower than Non-HIV-HHs though total monthly expenditure exceeded income in both HIV and Non-HIV-HHs. This discrepancy could be due to underreported or unreported income for activities undertaken within the informal sector [52], which is relevant to a large proportion of the population in Asia [53].

Despite the substantial progress in the fight against HIV/AIDS, and enormous global commitment in funding[54] HIV-HHs continue to experience higher health service costs than Non-HIV-HHs

Table 4
Overview of employment, strategies for coping with household liabilities and food security.

Author, year, Country	Employment HIV-HHs (Non-HIV-HHs)			Strategies for coping with household liabilities HIV-HHs (Non-HIV-HHs)		Food security at HIV-HHs (Non-HIV-HHs)
	Absenteeism per month	Decrease in wages per year%	Unemployment%	Sold off assets%	Borrowings%	
Batteh et al. [19], 2008, Cambodia	2.65 days (0.67 days)	77% (54%)	41% (6.6%)	66.6% (32.2%)	56% (37%)	69.4% (52.6%) spent less on food
Dasgupta et al. [40], 2016, India	..	..	..	8.10%	13.9% loans from micro-financing institutions and 56.1% from other source	49.1% food insecure; 43.4% chronically food insecure
Poudel et al. [29], 2017, Nepal	3.6 days	..	..	..	..	..
Riyarto et al. [43], 2010 Indonesia	..	..	..	20%: 2%*	11%:1%*	..
Zhang et al. [38], 2012, China	..	..	21.1%	..	..	..
Pradhan et al. [45], 2006, India	3.3 days	36.48% of PLHIV	..	..	..	..
Kumar et al. [42], 2017, India	1.1 days	..	..	..	..	..
Taraphdar et al. [37], 2011, India	14.28 days	..	..	..	..	..
Elsland et al. [21], 2011, India	..	..	..	..	..	40.2% food insecure; 23.5% no food for a whole day; 35.6% cut size or skip a whole meal; 31.1% eat less than need
Cercone & Pinder [35], 2010, Cambodia	..	..	..	..	65% (53%) was in debt	..
Phong et al. [27], 2005, Vietnam	..	..	..	20.8% sold assets and 5.6% sold land or a house	36% from friends and relatives; 27.2% from money lenders	28.8% spent less on food
Kangmai et al. [24], 2009 China	..	..	25.2% (4.7%) #	10.9% (5.2%)	60.7% (66.7%)	..
Duraisamy et al. [20], 2006, India	2.3 days	..	21% (11%)	8%	67%	..
Cercone & Pinder [11], 2011, Indonesia	7.5 days	..	17.6%#	25.1%	95.3% from family and friends; 14.9% from banks; 17.1% from money lenders	..
UNDP[34] 2009, Vietnam	..	..	..	34% (16%)	39.2% (23.6%)	..

Note: * This indicates comparison between Jakarta ART and Jakarta Non-ART households.

individual perspective not in HH level.

in Indonesia and China. This is similar to earlier evidence that has highlighted the economic burden and economic barriers to accessing HIV services [55,56]. However, our findings suggest no significant burden due to expenditure on pharmaceuticals (as a proportion to direct health expenditure), implying positive outcomes from the global efforts to provide affordable treatment for HIV-HHs in resource-constrained settings [54,57].

Almost four decades into the epidemic, HIV/AIDS continues to affect employability leading to higher unemployment rates and more days of absenteeism, therefore leading to significant decline in wages for affected households and individuals. Comparable to previous studies, productivity loss through lost work time or caring responsibilities due to HIV/AIDS is an ongoing challenge despite advances in treatment [29,50,58]. It is therefore not surprising that our review has confirmed that HIV-HHs continue to report

higher levels of borrowing and selling off assets compared to Non-HIV-HHs to cope with income loss.

HIV-HHs are more likely to face food insecurity than Non-HIV-HHs despite the critical need for adequate nutrition in PLHIV, which is vital for their health, survival [59,60] and adherence to treatment [60]. HIV-HHs experienced food insecurity despite being more likely to receive institutional social support than Non-HIV-HHs, including food support, for example in Cambodia [19]. This suggests that inclusion of food assistance in a comprehensive package of care for HIV-HHs is crucial to reduce the burden to HIV-HHs in resource-limited settings. Social support for PLHIV has been shown to be important in improving health related quality of life [61], labour productivity and savings [62]. The HIV-HHs in our review received higher instrumental social support (materials, medical and financial assistance) than Non-HIV-HHs but had limited

Table 5
Overview of social protection.

Author, Year, Country	Types and source of social support	% of households receiving support	
		HIV-HHs	Non-HIV-HH
Toth et al. [44], 2018, Cambodia	Transportation allowance	53.6%	..
	Food support	76.5%	..
	School allowance	62.1%	..
	Emotional counselling	35.3%	..
	Vocational training	22.9%	..
	Home visit	11.1%	..
	Financial support (Source unknown)	34.8%	..
Pradhan et al. [45], 2006, India	Family support	17.7%: 11.9% (male: female)	..
	Friends support	1.6%: 3.8% (male: female)	..
Cercone & Pinder [35], 2010, Cambodia	Food support	57.5%	3.6%
	Source of food support:	94.3%	43.3%
	NGO	2.2%	15.2%
	Government program	0.4%	1.9%
	Community	0.7%	3.1%
	Friends	2.2%	30.8%
	Family		
Kangmai et al. [24], 2009, India	Medical insurance	73.5%	88.2%
	Life insurance	0.6%	6.0%
	Pension	1.7%	3.4%
	Source of economic support:	31.3%	..
	Government support	22.9%	..
	Minimum living standard assistance	13.6%	..
	Other support	20.3%	..
	Society support		
UNDP[34] 2009, Vietnam	NGO	34.5%	0.6%
	neighbour	22.4%	44.8%
	Friends/ relatives	48.9%	84.1%
	Types of support:	10.6%	9.5%
	Loan	7.1%	2.0%
	Support for School fees	15.5%	2.4%
	Financial support for healthcare	7.9%	1.3%
	Support for food	62.3%	3.3%
	Support for medication		

emotional and information support, which are critical to the needs of PLHIV [63]. This suggests the need to improve this gap in social support to address the needs of PLHIV.

Regarding the added burden of NCDs on HIV-HHs, results of a single study highlight the paucity of evidence that explores the nexus between HIV/AIDS and NCDs in resource-limited regions such as the APR. Such regions are grappling with challenges of emerging NCD burden and health systems that are yet to develop a chronic care model [13]. To the best of our knowledge, this study is the first systematic review to examine the socioeconomic burden of HIV/AIDS and the first to examine the added socioeconomic burden of NCDs on HIV-HHs in the APR or any geographical region in the world. Despite the known association between HIV and NCDs [64,65], there is no systematic review that has considered the added impact of the burden related to NCDs on HIV-HHs. Therefore there was not enough evidence from this systematic review to address our second aim to investigate the added socioeconomic burden of NCDs on HIV-HH in the APR. The strength of the review included a comprehensive search strategy, extensive search of multiple databases, pairs of reviewers at all review stages to minimize random errors and bias in selection of studies, and registration with PROSPERO for transparency and rigour. Our findings have several limitations. The evidence base on the added burden of NCDs for PLHIV is weak with a paucity of research in this area. Furthermore, all reviewed studies were observational studies, and heterogeneity of included studies in data collected and methodology of estimations for the socioeconomic domains made comparability across countries and generalizability challenging. Lack of data based on socioeconomic quintiles for households limited exploration by socioeconomic levels. There was variation in the risk

of bias and quality of included studies, with a third of the studies assessed as poor quality with high risk of bias. Lastly, relevant studies may have been missed due to exclusion of studies not published in English.

Despite the above limitations, findings of this research have important implications. The single identified study on the added burden of NCDs for PLHIV and HIV-HHs highlights the need for further research that links HIV/AIDS and NCDs for PLHIV, which has been overlooked in current HIV research and policy. Further research is essential to adequately understand challenges of having both these conditions in order to effectively develop treatment plans and health services that integrate HIV/AIDS and NCD care into existing health systems to reduce the burden to sufferers. Integration of HIV/AIDS and NCDs into national and global policies on treatment of HIV/AIDS cannot be ignored since PLHIV are becoming older and more likely to have comorbidities due to ageing and prolonged HIV treatment [57,13]. Linking care of these health conditions will contribute to reducing the burden to affected individuals and households especially the associated financial burden of care and access to health care services. Ultimately, it is crucial for public health policies and community initiatives to develop and adapt policies that link HIV/AIDS and NCD management to ensure healthy ageing for PLHIV.

In conclusion, HIV/AIDS continues to pose a great burden on affected households in APR, despite the remarkable global effort to fight HIV/AIDS. This burden is reinforced by lower income from employment, increased expenditure on health care, and a loss of capital to meet the deficit between income and expenditure. There is limited evidence on the added burden of NCDs on HIV/AIDS households in resource-constrained settings in APR. Understanding

the interplay of HIV/AIDS and NCDs and the socioeconomic impact on affected households is crucial in the era of ageing PLHIV, and the design of relevant public policy especially in the APR where there is a high prevalence of both HIV and NCDs.

Contributors

JAO and SB initiated the conceptualization of the study design and led the systematic review. SB, JAO, SWAD, IM and RS conducted the title and abstract review, full text review, data extraction and quality assessment under guidance of JJW. SWAD, IM, SB and JAO did manuscript writing and preparation. All senior reviewers (JJW, RS and BC) reviewed all the drafts and approved the final manuscript.

Declaration of Competing Interest

Dr. Ben Coghlan received a UNDP grant to implement the Myanmar study referenced in this review (Cercone J, Pinder E, Pothuis M, Lotmore K, Aung P, Coghlan B. The socio-economic impact of people living with HIV at the household level in Myanmar. UNDP. 2016). No conflict of interest was reported for other authors.

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Supplementary materials

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