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Effective coverage of diabetes and hypertension: an analysis of Thailand's national insurance database 2016–2019

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ABSTRACT

Objectives This study assesses effective coverage of diabetes and hypertension in Thailand during 2016–2019.
Design Mixed method, analysis of National health insurance database 2016–2019 and in-depth interviews.
Setting Beneficiaries of Universal Coverage Scheme residing outside Bangkok.
Participants Quantitative analysis was performed by acquiring individual patient data of diabetes and hypertension cases in the Universal Coverage Scheme residing outside bangkok in 2016-2019. Qualitative analysis was conducted by in-depth interview of 85 multi-stakeholder key informants to identify challenges.
Outcomes Estimate three indicators: detected need (diagnosed/total estimated cases), crude coverage (received health services/total estimated cases) and effective coverage (controlled/total estimated cases) were compared. Controlled diabetes was defined as haemoglobin A1C (HbA1C) below 7% and controlled hypertension as blood pressure below 140/90 mm Hg.
Results Estimated cases were 3.1–3.2 million for diabetes and 8.7–9.2 million for hypertension. For diabetes, all indicators have shown slow improvement between 2016 and 2019 (67.4%, 69.9%, 71.9% and 74.7% for detected need; 38.7%, 43.1%, 45.1% and 49.8% for crude coverage and 8.1%, 10.5%, 11.8% and 11.7% for effective coverage). For hypertension, the performance was poorer for detection (48.9%, 50.3%, 51.8% and 53.3%) and crude coverage (22.3%, 24.7%, 26.5% and 29.2%) but was better for effective coverage (11.3%, 13.2%, 15.1% and 15.7%) than diabetes. Results were better for the women and older age groups in both diseases. Complex interplays between supply and demand side were a key challenge. Database challenges also hamper regular assessment of effective coverage. Sensitivity analysis when using at least three annual visits shows slight improvement of effective coverage.
Conclusion Effective coverage was low for both diseases, though improving in 2016–2019, especially among men and younger populations. The increasing rate of effective coverage was significantly smaller than crude coverage. Health information systems limitation is a major barrier to comprehensive measurement. To maximise effective coverage, long-term actions should address primary prevention of non-communicable disease risk factors, while short-term actions focus on improving Chronic Care Model.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study uses the largest health service data set from National Health Security Office, which cover more than 34 million adults under Universal Coverage Scheme (UCS) living outside of Bangkok.
- ⇒ Mixed-method study design comprising of quantitative and qualitative studies provides thoroughly understanding of the health service situation.
- ⇒ The study could not cover UCS beneficiaries who is living in the Bangkok and other scheme beneficiaries due to fragmentation of the database.
- ⇒ Using surrogate outcomes (haemoglobin A1C; HbA1C and blood pressure), despite being easily measurable, may not always lead to individual health gain as wished by effective coverage concept.
- ⇒ Incompleteness of database, as only 84.1%–90.4% and 75.6%–84.0% of diagnosed diabetes and hypertension patients had complete health facilities visit data. Moreover, 28.6%–41.1% of diabetes patients and 9.1%–16.8% of hypertension patients, who received health services, did not have their HbA1C or blood pressure record.

INTRODUCTION

Effective coverage (EC), defined as the 'fraction of real health gained from an intervention', can be used as an indicator to measure health system performance.[1 2] Contrasting traditional measures of crude coverage which captures access to health services among those who need health interventions, EC accounts for health gains resulting from health interventions. EC can be applied to measure overall health system performance or select diseases, interventions, or conditions. As countries advance towards Universal Health Coverage (UHC), EC measures provide higher granularity for assessing health system performance compared with conventional crude coverage of health services.[2–4]

Since 2002, Thailand has implemented UHC through three publicly financed insurance schemes; Civil Servant Medical Benefit

Scheme (CSMBS) covering 4.4 million of civil servants and their dependants managed by Comptroller General's Department; Social Health Insurance (SHI) covering 10.6 million of private sector employees managed by the Social Security Office; and the Universal Coverage Scheme (UCS) for the remaining 48 million population, managed by the National Health Security Office.[5] However, whether UHC has resulted in better health outcomes for the population is unknown, therefore warranting studies on the EC of health services under UHC.

Non-communicable diseases (NCDs) account for more than two-thirds of global deaths, with a rising burden of disease.[6] Diabetes and hypertension are the two main drivers of NCD prevalence globally.[7 8] In Thailand, the prevalence of diabetes among Thai adults has increased from 6.8% in 2004 to 8.9% in 2014, while hypertension has increased from 21.4% to 24.7% in the same period.[9] In 2014, diabetes ranked first and seventh among women and men, respectively, for disability-adjusted life year loss in Thailand.[10 11] Given the significant burden of disease, diabetes and hypertension are national target priority diseases for the Thai Government.[12]

In assessing EC, three important indicators must be defined and investigated: (1) detected need, (2) crude coverage and (3) EC. Due to the variations in available data and desired health outcomes across different EC studies, there is no universal criterion or definition for each indicator.[1 13–23] The data used for the calculation of EC also highly varies across different studies from individual-level health service data to health surveys to estimate health status in the population.[13–23]

This study aims to estimate EC indicators for diabetes and hypertension using administrative health service databases in Thailand. In addition, we seek to understand the barriers of achieving high EC and the challenges of regular assessment of EC as a measure to monitor health system performance using multistakeholder semistructured interviews.

METHODS

A mixed method research design was applied using secondary data analysis of administrative health service datasets and key informant interviews.

Quantitative data analysis

The quantitative component of this study aims to estimate EC indicators for diabetes and hypertension, disaggregate by sex and age group and describe the time trend.

Study populations and data sources

Our study populations were diabetes and hypertension patients aged 15 and older who were members of the UCS outside of Bangkok between 2016 and 2019. We excluded those registered with health facilities located in Bangkok due to limitation in accessing the data and populations aged less than 15 years old because prevalence data for children are not recorded.

Four consecutive years, 2016–2019, of three sets of databases were retrieved and analysed. (1) Outpatient health prevention and promotion database held by the National Health Security Office with individual patient health records for each outpatient visit; (2) electronic claim database held by the National Health Security Office with claim data from healthcare facilities for inpatient and high-cost outpatient health services; (3) civil registration database held by the Ministry of Interior with number of populations by age and sex for estimating total diabetes and hypertension cases in the population.

Defining EC indicators

The definition of the indicators was guided by previous literature, taking into account data availability in Thailand and were peer-reviewed by relevant clinical specialists and Ministry of Public Health (MOPH) officers.[9 24–29]

Estimated cases

Estimated cases are the number of total national diabetes and hypertension individuals estimated using the age and sex-specific prevalence rates from the National Health Exam Survey (NHES) 2014 (the latest available at the time of study) multiplied by the number of respective UCS populations in 2016–2019. Diabetes cases in the NHES 2014 were defined as patients diagnosed by doctors, taking medication or with a Fasting Plasma Glucose (FPG) ≥126 mg/dL, while hypertension cases were defined as patients diagnosed by doctors, taking medication or with a blood pressure (BP) ≥140/90 mm/Hg.[9]

Diagnosed cases

Diagnosed cases are the number of patients diagnosed with diabetes or hypertension based on the International Classification of Diseases (ICD10), 'E10-E14' for diabetes and ICD10 'I10-I14' for hypertension.

Patients who received health services

Patients who received health services are diagnosed cases who visited health facilities at least four times in a year. We used the four visits based on the average 3-month interval of diabetes and hypertension health service visits in Thailand.[29]

Controlled cases

Controlled cases are those who received health services and had the most recent haemoglobin A1C (HbA1C) level of less than 7% for diabetes or the latest two consecutive visit BP value of less than 140/90 mm Hg for hypertension, which are benchmarks produced by MOPH Key Performance Indicators (KPI) and Thailand Clinical Practice Guidelines.[24–26]

The operational definitions of the numerators and denominator for all indicators are summarised in table 1. Stata V.14.0 (Stata, TX Serial number: 401406358220) was used for data analysis.

Table 1 Definition and formulae of three key indicators for diabetes and hypertension used by this study

	Detected need	Crude coverage
Definition	Proportion of diagnosed cases to total national estimated cases	Proportion of patients who have received continued health services to the total national estimated cases
Diabetes	# Patients Diagnosed with ICD 10 E10−E14 / # Estimated Cases of Diabetes	# Patients that recieved health services≥4 times per year / # Estimated Cases of Diabetes
Hypertension	# Patients Diagnosed with ICD 10 I10−I14 / # Estimated Cases of Hypertension	# Patients that recieved health services≥4 times per year / # Estimated Cases of Hypertension
	Effective coverage	
Definition	Proportion of patients who have received continuous health service and demonstrated health gains to the total national estimated cases	
Diabetes	Patients that recieved health services≥4 times per year AND have a latest HbA1C result of<7% / # Estimated Cases of Diabetes	
Hypertension	Patients that recieved health services≥4 times per year AND have a BP result of 140/90 in the last 2 visits / # Estimated Cases of Hypertension	

BP, blood pressure; HbA1C, haemoglobin A1C; ICD, International Classification of Diseases.

Key informant interviews

Semistructured key informant interviews were conducted between May and August 2019. The aim of the interviews was to identify (1) barriers to greater level of EC for diabetes and hypertension service in Thailand and (2) challenges in measuring EC.

A total of 85 key informants from three groups of experts participated in this study. (1) Clinical specialists were identified from a list of university professors with expertise in managing diabetes and/or hypertension and experts from the National Diabetic Society and National Hypertension Society; (2) healthcare providers and public health officers were selected from the provinces with high, moderate and low performance in managing diabetes and hypertension against the MOPH KPI on diabetes and hypertension control in 2018.[26] (3) Academics and experts on public health insurance were purposively selected from the MOPH's technical departments and each of the three public health insurance agencies, respectively; see online supplemental table 1.

Written informed consent and permission to audio record were sought prior to each interview. Audio records were transcribed, and data were extracted through a qualitative thematic analysis approach and finalised through discussion among researchers.

RESULTS

Between 2016 and 2019 UCS, excluding Bangkok, comprised of approximately 34.1–34.5 million adult populations with a balanced men–women ratio. Across 4 years, nearly 80% were aged between 15 and 60 years and 21%–24% were elderly aged 60 and over; see table 2.

Total diabetes and hypertension cases among the UCS members

Of total UCS members residing outside of Bangkok, the estimated cases were 3.2 million for diabetes and 9.2 million for hypertension in 2019. Estimated cases of diabetes and hypertension in 2019–2019, stratified by age and sex, are presented in online supplemental tables 2 and 3.

EC estimates

In 2019, of the 3.2 million estimated diabetes cases, 74.7% had been diagnosed and 49.8% received continued health services of at least four visits per year. Of the 9.2 million estimated cases of hypertension; 53.3% were diagnosed and 29.2% received treatment during at least four health visits per year; see figure 1.

Based on these values, the EC was estimated as 11.7% of total estimated cases at a HbA1C benchmark of <7% for diabetes, and 15.7% of total estimated cases for hypertension at a benchmark of least four visits and controlled BP below 140/90 mm Hg in the last two consecutive visits.

Four-year trend analysis

A 4-year increasing trend of all indicators between 2016 and 2019 was found for both diabetes and hypertension.

Diabetes detected need increased by 7.3 percentage points (67.4% to 74.7%) while the crude coverage increased by 11.1 percentage points (38.7% to 49.8%). However, EC of diabetes increased at a slower pace of 3.6 percentage points (8.1% to 11.7%).

Detected need of hypertension increased by 4.4 percentage points (48.9% to 53.3%), crude coverage increased by 6.9 percentage points (22.3% to 29.2%), while EC increased by 4.4 percentage points (11.3% to 15.7%).

Figure 1 illustrates a large gap between crude and EC; up to 38.1 percentage points in 2019 for diabetes and 13.5 percentage points for hypertension.

Age–sex stratification

Older age group, 60 years and older, was found to have higher detected need rate for both diabetes and hypertension. In 2019, diabetes rates were higher by 39.7 percentage points for detected need, 30.4 percentage points for crude coverage and 11.1 percentage points for EC compared with those aged under 60 years; see

Table 2 Characteristics of the study population who are UCS members residing outside Bangkok, 2016–2019, and prevalence of diabetes and hypertension by age and sex

Characteristics/fiscal year (FY)	2016 (n, %)	2017 (n, %)	2018 (n, %)	2019 (n, %)
Total population	34 189 536	34 218 161	34 538 221	34 112 609
Sex				
Female	17 322 452 (51%)	17 332 181 (51%)	17 323 392 (50%)	17 249 648 (51%)
Male	16 867 084 (49%)	16 885 980 (49%)	17 214 829 (50%)	16 862 961 (49%)
Age group				
15 to less than 60 years	26 932 819 (79%)	26 692 965 (78%)	26 717 187 (77%)	25 972 544 (76%)
60 years and older	7 256 717 (21%)	7 525 196 (22%)	7 821 034 (23%)	8 140 065 (24%)

Prevalence												
Age group	15–29		30–44		45–59		60–69		70–79		≥ 80	
Sex	M	F	M	F	M	F	M	F	M	F	M	F
Diabetes	1.50%	2.80%	5.00%	5.60%	11.80%	12.40%	16.10%	21.90%	15.00%	21.80%	12.40%	11.30%
Hypertension	5.90%	2.00%	22.00%	11.70%	33.40%	32.10%	47.20%	49.50%	52.60%	60.10%	58.70%	68.90%

UCS, Universal Coverage Scheme.

figure 2. Similarly, hypertension rates among older age were higher by 35.3 percentage points for detected need, 22.4 percentage points for crude coverage and 11.5 percentage points for EC; see figure 3. Note that populations younger than 60 years consist of 54.6% of total estimated diabetes cases in the country (1.7 out of 3.2 million) and 52.6% of total estimated hypertension cases in the country (4.8 out of 9.2 million); see online supplemental tables 2 and 3.

Women outperformed men in all three indicators for both diabetes and hypertension. Diabetes rates were higher by 26.1 percentage points for detected need, 24 percentage points for crude coverage and 4.8 percentage points for EC in 2019; see figure 2. Hypertension rates were higher by 26.6 percentage points for detected need, 19.1 percentage points for crude coverage and 10.6 percentage points for EC; see figure 3.

Age–Sex analysis in 2016, 2017 and 2018 yielded similar results; see online supplemental tables 2 and 3.

Sensitivity analysis: using at least three annual visits

We conducted a sensitivity analysis using at least three annual visits compared with the main study findings, which used at least four annual visits; see figures and tables in online supplemental annex 1.

For hypertension, sensitivity analysis found that the EC of hypertension increased by 4.8 percentage points, from 15.7% to 20.5% in 2019. Over the 4 years, the average percentage point change of EC was 3.1 percentage points, while average change in crude coverage is 5.2 percentage points.

For diabetes, sensitivity analysis revealed that the EC increased by 1.3 percentage points, from 11.7% to 13% in 2019. Over the 4 years, the average percentage point change of EC was 1.2 percentage points, while average change of crude coverage was 6.4 percentage points.

The sensitivity analysis of frequency of visits reveals that EC is less sensitive than crude coverage for both diseases. There are noticeable, but not major changes in either indicator for both diseases.

Health systems: barriers to EC

Several health systems' bottlenecks impact the EC for both conditions.

Supply-side barriers

NCD clinics in public health facilities operating only 8–16 hours on week days, is inconvenient for patients who are still working especially under 60 years; this leads to a loss to follow-up and discontinuity of treatment. Community screening by subdistrict health centres for adults >35 years, one of the main approaches to identify new cases, cannot cover all target populations, especially among the working age and those live in urban areas. UCS implements capitation contract model for outpatient services, which requires UCS members to register with a primary healthcare network consisting of health centres and a district hospital in rural area or health centres and

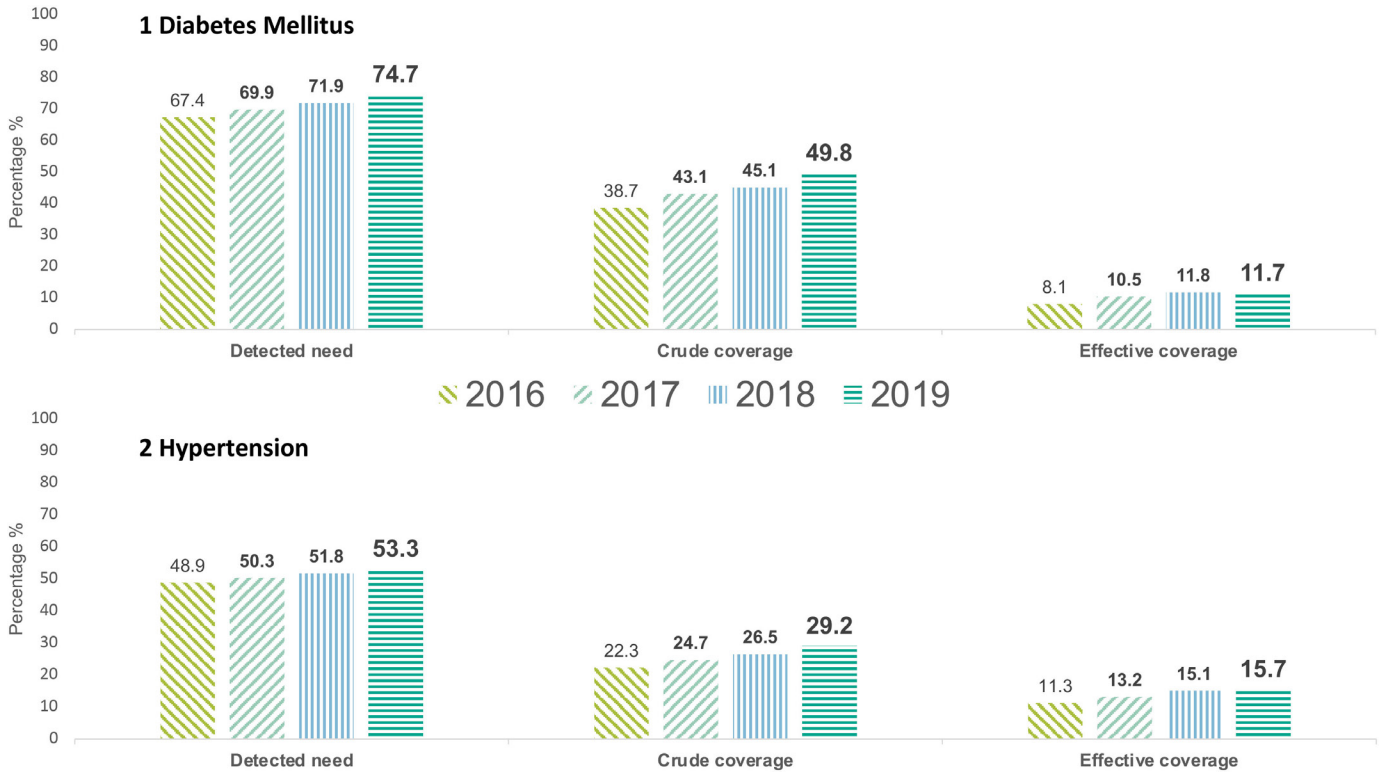

Figure 1 Effective coverage indicators for 1. diabetes and 2. hypertension 2016–2019.

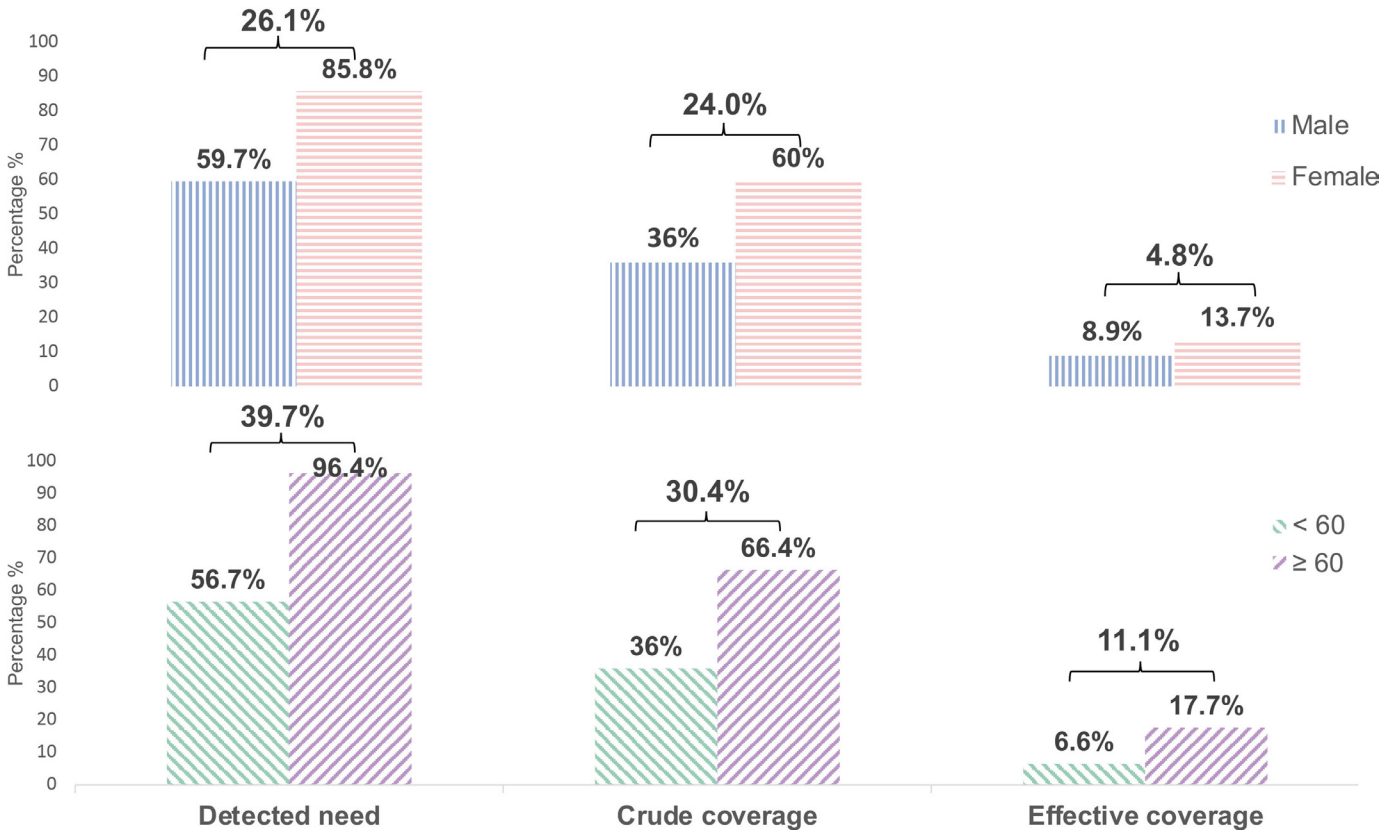

Figure 2 Effective coverage indicators for diabetes stratified by sex and age group.

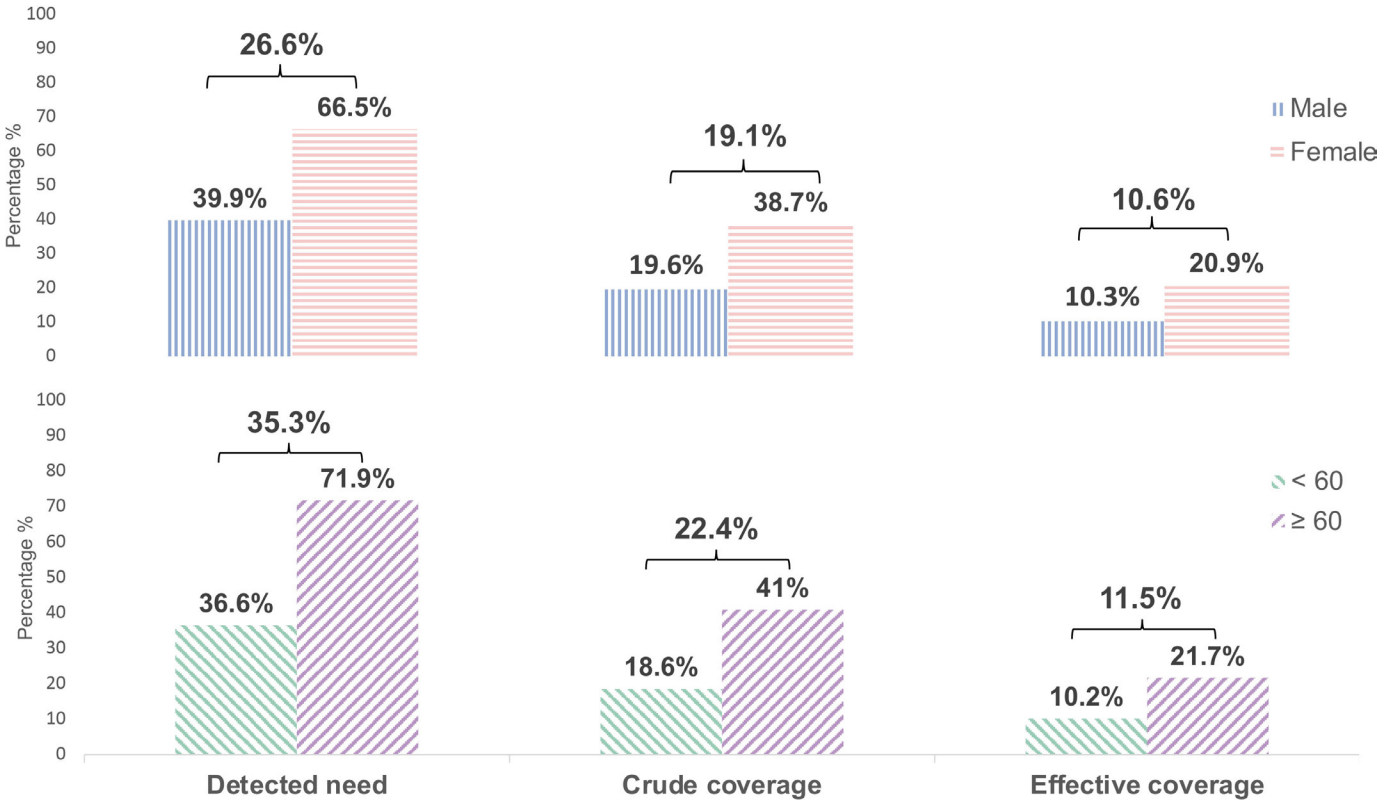

Figure 3 Effective coverage indicators for hypertension stratified by sex and age group.

provincial hospitals in urban areas, where all services including NCD screening need to seek from this network.

To facilitate internal migration by the working age who seek job in urban cities outside their domicile districts, reregistration with a new network in the city enables access to care by these members; however, the reregistration process is not convenient for the patient. Despite these efforts, EC among younger age group is low. Furthermore, NCD is among all competing health agendas from the healthcare provider perspectives. Significant increased health service workloads result in over-crowding, long waiting times and inadequate times for quality counselling in particular non-pharmacological interventions to NCD patients

> Urban settings are different. Some communities shut the door on us when we went out for screening diabetes and hypertension, some even threatened to take legal actions against trespassing. Even though we are health officers, if they do not welcome us, we cannot do anything, especially NCDs in condominiums (KI216 District Health Office).

> For those who have been diagnosed, treated, but loss to follow-up, we do not have the ability to track them. Some work outside the community (KI218 Provincial Health Office).

Demand-side barriers

Lifestyle and patient behaviour also limit EC. Some patients do not cooperate to follow-up or adhere to lifestyle modifications, such as continue to smoke and drink alcohol, while providers do not have enough time for counselling

> Health education cannot change their lifestyle. Patient knows everything but does not follow our recommendations (KI240 District Health Office).

Although a subdistrict health promotion fund, jointly invested by the National Health Security Office and local government, has been allocated for specific interventions relevant to local context; staff at subdistrict health centres have yet to maximise use of this fund to counteract the social determinants of NCDs such as tobacco, alcohol and unhealthy diet.

> The local health promotion fund aims to empower the local community to solve priority health problems. It has yet to overcome bureaucratic rigidity in using this fund (KI405 Health Insurance).

Information systems: barriers to measuring EC

Health data system

Staff at subdistrict health centres and district hospitals are responsible for entering all data in the electronic recording system for NCDs such as detection, registration, visits for treatment and outcomes in term of HbA1c and BP linking each record to each patient unique citizen identification number. However, limited human capacity, inadequate skill on information technology, lack of support and supervision result in inadequate validity

and completeness of data systems for performance assessments.

> We try to learn, however, the process of data entry changes quite often. There are massive details which we need to learn by ourselves. Provincial or District IT experts never comes to help (KI213 Health Centre).

> We do not have enough manpower at the health centres. We hire contractor workers for data entry. Some of them are high school graduated unemployed relatives of Village Health Volunteer (KI223 Health Centre).

Governing the health systems

The MOPH sets high KPI standards without thorough consultation with local health workers to probe its feasibility and challenges. From 2016 to 2019, screening target for diabetes and hypertension was set at >90% of the population aged 35 and over, while the control target was set at ≥40% for diabetes (with HbA1C <7%) and ≥50% for hypertension (with BP<140/90 mm Hg).[26] This puts significant pressure on local health officers to report untrue higher data especially in the context of inadequate audit capacity.

> MOPH sets too high KPIs, sometimes not realistic, MPOH should consult with the local. Otherwise, if the KPI is unrealistically high, the MOPH may receive the high-performance data, but reliability remains a question (KI216 District Health Office).

Additionally, there are no KPIs for continuous treatment rate or loss to follow-up rates, which are crucial for performance assessments. The current fragmentation of information systems is complicated by inadequate Health Information Exchange system among health facilities to provide seamless care.

DISCUSSION

Detected need, crude coverage and EC

Though this study demonstrates an increasing trend of all three indicators, between 2016 and 2019, the level of EC is still low. Diabetes service shows lower EC than hypertension service in Thailand, which is similar to the situations in the Republic of Korea but in contrast with those in South Africa where diabetes service showed better coverage performance.[14–16 19]

While EC estimates from the NHES 2014 reported higher results compared with our study, the indicator definitions were also less stringent definitions applied for the indicators.[9] Total estimated cases were calculated from actual number of patients in the survey. Detected need was defined as the proportion of patients previously diagnosed by a doctor or taking medication to the total estimated cases; crude coverage was defined as the proportion of patients who received medication to the total estimated cases; and EC was defined as the proportion of patients who received medication and had an Fasting Plasma Glucose (FPG)<130 mg/dL for diabetes and BP<140/90 mm/Hg for hypertension in the survey to the total estimated cases. This resulted in a detected need, crude coverage and EC for diabetes of 56.9%, 54.1% and 23.5%, respectively, and 55.3%, 49.2% and 29.7%, for hypertension, respectively. However, in line with our results, the paper found higher EC for those 60 years and older and women.

Supply and demand side barriers

The office hour community-based NCD screening, provided through healthcare workers and village health volunteers, is not convenient for working populations with long lead times, resulting in loss to follow-up.[30] The lack of screening service for walk-in and after hour services results in significant lower detected need in working age.

Though continuous care is the key to success, patients are lost to follow-up.[24 25 27 28] On the patient side, regular visits and long waiting time, though four times a year, can be a burden from taking time-off work. Moreover, patients are complacent as there is no significant symptom or unconvinced in the benefits of treatment.[31 32] On the provider side, diabetes and hypertension rank first and second highest workload in outpatient departments, accounting for 30% of visits to MOPH hospitals(79 million visits in 2019).[33]

A multidisciplinary team and Chronic Care Model—a collaborative partnership among patients, providers and health system, which incorporates a multilevel approach, are required to improve quality, particularly for diabetes patients whose behaviours play an important role in treatment outcomes.[24 25 27 28 34–36] However, the heavy workload leads to inadequate counselling on non-pharmacologic interventions. Additionally, limited choices of diabetes drugs (15 medicines) in the National List of Essential Medicine compared with hypertension (25 medicines) results in large gap between crude and EC.[37]

Patient's attitude and perception plays significant role. A qualitative study in Thailand found that patients' experiences of severe complications from diabetes have better medication adherence, while lacking overt symptoms results in complacency, and that 'normal' blood sugar levels are interpreted by patients as cure and there is no need for continued medication.[38] Adequate diabetic health literacy and better glycaemic control are highly correlated.[39] Another study from Thailand showed 61% of 312 type 2 diabetes patients had poor glycaemic control, as two-thirds of them had moderate health literacy levels.[40] Another study showed that 48.7% of Thai hypertensive patients had inadequate health literacy.[41]

Though inconvenient service hours can explain the low coverage indicators among working-age patients; underlying factors on gender disparity is unknown, warranting further investigation such as gender-specific awareness and health literacy.

The increased prevalence of diabetes and hypertension (3.1% and 3.3% in 10 years, respectively) is complicated by the low EC. Primary prevention is a key policy choice.

Cochrane review reports no firm evidence that diet or physical activity alone can influence the risk of type 2 diabetes mellitus (T2DM); but doing both reduces or delays the incidence of T2DM in people with impaired glucose tolerance.[42] Healthy diet and physical activity promotions are active campaign since 2001 by Thai Health Foundation.[43] Thailand may capitalise the high prevalence of adequate moderate-to-vigorous physical activities and many WHO recommended NCD measures implemented, such as sugar sweetened beverages tax, strengthening food environment, regulation of food marketing, alcohol and tobacco control.[44–47] However, significant efforts are required to reverse the worsening prevalence trend.

Methodological challenges

This study uncovers methodological challenges. There is no consensus on how EC indicators of diabetes and hypertension services are defined.[1] There are many options and cut-off point that researcher may use. Our study defines crude coverage as those who visited health facilities at least four times in a year. For EC, we rely on two surrogate outcomes with cut points. However, other choices of indicators such as 'on medication', 'ever visit a doctor' for crude coverage or 'fasting blood sugar level below 126 mg/dL', 'no complications', 'HbA1C <6.5%' are also conceptually and clinically acceptable.

Feedback from peer-review process suggested that selection of any surrogate parameters must consider not only clinical guidelines but also availability of data. It should also be acknowledged that using surrogate outcomes, despite being easily measurable, may not always lead to individual health gain as wished by EC concept.

A lack of standardised methodology leads to different studies employing varying definition and methods, which makes cross-study comparison, systematic review or meta-analysis problematic. We recommend that a country aiming to use EC for policy decision must seek for a methodology consensus among stakeholders prior to data collection. Factors to be considered include choice of indicators and cut-off points, data feasibility, interpretation capacity and acceptance by stakeholders. A standardised methodology, at least at country level, will allow performance evaluation across time periods comparable and facilitate performance improvement.

Limitations

Key limitations relate to database and methodology. This study is not representative of the whole country as it covers only patients under Thailand's UCS. Two other schemes CSMBS and SHI do not have such records. This study also excluded 6 million population in Bangkok due to lack of data.

There is no rigorous assessment of the validity of records such as ICD 10 diagnosis or biological markers. The interconnectivity of database is a key gap for maximise use by healthcare providers in clinical service provision and monitoring outcome. High level of KPIs can lead to data creeping as data audits are inadequate.

The national health examination survey does not cover population under 15 years old. Its 5-year survey interval cannot produce prevalence rate applied as denominators for all three indicators in a timely manner.

Even though using HbA1C at <7% at the last visit is simple and easy to understand by policymakers, it is not in line with the current clinical practice which recommends 3–6 months regular monitoring of HbA1C according to biologic and socioeconomic profile of each patient. For hypertension, the well-accepted BP target of below 140/90 mm Hg requires more points of BP monitoring.

In real-life clinical settings, there are patients who come with a primary diagnosis other than diabetes or hypertension, such as cardiovascular conditions or chronic kidney diseases where diabetes and hypertension are comorbidities. They also receive treatment for the two conditions. This study misses such cases which can affect the EC due to limitations in the data. The development of a chronic diseases registry in the future would eliminate this problem and improve long-term follow-up of health outcome.

Finally, incompleteness of database was identified for both diseases. To calculate crude coverage, the total number of health facilities visits per year is required; however, data in 2016–2019 revealed only 84.1%–90.4% and 75.6%–84.0% of diagnosed diabetes and hypertension patients had complete health facility visit data. In the same period, 28.6%–41.1% of diabetes patients and 9.1%–16.8% of hypertension patients, who received health services (having ≥4 times health facilities visits per year) did not have their HbA1C or BP records, which limited the ability to calculate EC estimates. As a result, this undetermined whether patients missed health service visits or whether visits were not recorded. Although the problem is gradually improving over the years, the incompleteness of data hampers accurate estimates of EC.

Conclusion and recommendations

Our study found that EC estimates for diabetes and hypertension service in Thailand were low despite showing an increasing trend. Three indicators, detected need, crude coverage and EC, suggest large gaps along service cascades which are influenced by supply-side and demand-side determinants. The current primary healthcare capacity has been constrained by huge workload of limited health staff.

We recommend short-term strategies as follows:

First, increase patient awareness through empowerment can improve medication adherence. A systematic review suggests 'joint empowerment', which is the interaction between doctor and patient, can strengthen patient's control over the disease management and medication adherence.[48] Furthermore, higher perceived self-efficacy in patients was associated with self-care and medication adherence; patients' perceived self-efficacy was correlated

with self-management behaviour.[49] Reduce time lag between screening and definitive diagnosis can minimise the gap between detected need, treatment initiation and crude coverage. Moreover, screening services should be extended from the current subdistrict health centres to any public and private healthcare facilities for increased accessibility by all.

Second, minimise the gaps between crude and EC through the application of chronic care model, which requires a paradigm shift to team-based care, increased attention to non-pharmacological intervention and patient empowerment. Diversify screening services from subdistrict health centres to any public and private healthcare facilities can increase the detected need indicator and improve records on key outcome measurement, HbA1c and BP.

Third, capitalise the potential opportunities from disruptive digital technology and innovations to support the current overstretched health personnel.

In parallel, long-term strategies focusing on primary prevention to slow down the prevalence should be emphasised. Strengthening campaign to modify lifestyle of diet calorie and total fat intake restrictions plus moderate-to-vigorous aerobic exercises can significantly improve diabetes risk factors; and that more intensive programmes are more effective for higher risk group.[50 51] Thailand can capitalise the current high level of adequate physical activity in the population, in addition to other combined interventions. Initiating and supporting population-based strategies aim to achieve a small reduction in BP in the entire population, by addressing risk factors, notably overweight, obesity, high sodium intake, low intake of potassium, unhealthy diet, high levels of alcohol consumption, low levels of physical activity.[52 53] In long run, these two recommendations will gradually slow down the increased prevalence of both conditions.

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