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Cost-Effectiveness Analysis Of The Medical Check-Up Program In Early Detection Of Non-Communicable Diseases (NCDs) At The Main Clinic Of The DPR RI

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Abstract

The DPR RI Main Clinic organizes a Medical Check-Up (MCU) program for employees of the Secretariat General (Setjen) of the DPR RI as an effort to early detect non-communicable diseases (PTM). DEDICATION 2024 Program data (n=1,063) showed a very high prevalence of NCDs: 89.6% of participants had at least one clinical disorder, with a predominance of central obesity (69.0%), hypertension (60.7%), and dyslipidemia (52.6%). Even though the MCU program budget ranges from IDR 1.3 million to IDR 2.5 million per participant, there has never been a formal economic study that calculates the cost efficiency per case of NCDs detected. Analyze the cost-effectiveness of the MCU program in early detection of NCDs at the DPR RI Main Clinic, including calculating the Average Cost-Effectiveness Ratio (ACER), Incremental Cost-Effectiveness Ratio (ICER), and Return on Investment (ROI) in preventing NCDs for four MCU package scenarios (Plan I–IV). Research using mixed methods approach with sequential explanatory design. The quantitative component is descriptive-analytic retrospective based on secondary data from MCU echelon II–IV medical records (n=208, total sampling), 2024 DEDICATION data (n=1,063), and 2022–2024 clinic financial reports. Unit cost calculations use the Activity-Based Costing (ABC) method. The qualitative component uses semi-structured in-depth interviews with 9 key informants based on Edward III's (1980) policy implementation framework. This research will produce ACER, ICER, and ROI values for the four MCU scenarios, as well as identify the implementation factors that have the most influence on program efficiency. Projections of budget requirements for the expansion of the MCU to 2,786 active employees of the Secretariat General of the DPR RI will also be produced based on an economics of scale analysis. Expected The MCU Main Clinic Program of the DPR RI is hypothesized to be cost-effective with an ACER value below the WHO willingness-to-pay (WTP) threshold of 1× Indonesia's GDP per capita (Rp. 66 million/case). Scenarios with greater participant coverage are predicted to produce lower ACER due to the economies of scale effect. The results of the research will be the basis for recommendations for MCU policies that are efficient, high quality and fair for all employees of the Secretariat General of the DPR RI.

Keywords: Cost-Effectiveness Analysis, Medical Check-Up, Non-Communicable Diseases, Acer, Icer, Activity-Based Costing, Early Detection, Dpr Ri Main Clinic

INTRODUCTION

Non-communicable diseases (NCDs) are the most serious global health challenge of the 21st century. The World Health Organization (WHO, 2023) reports that NCDs cause 41 million deaths per year or three out of four deaths worldwide, with the main spectrum including cardiovascular disease, malignancy, chronic respiratory disorders and diabetes mellitus. More than 77% of the death burden due to NCDs occurs in middle and low income countries, including Indonesia (WHO, 2023).

In Indonesia, PTM has been the cause of more than 70% of deaths (RI Ministry of Health, 2022). The 2018 Riskesdas survey recorded the prevalence of hypertension in 34.1% of adults, dyslipidemia in more than half of the population examined, and hyperglycemia in 10.9% (RI Ministry of Health, 2018). These figures show a consistent escalation compared to previous surveys and mark the urgency of systematic intervention based on early detection.

The DPR RI Main Clinic serves 2,786 active employees of the Secretariat General (Setjen) of the DPR RI as of January 2026 with a visit load of more than 4,260 outpatient visits per month (DPR RI Main Clinic Development Team, 2025). The periodic Medical Check-Up (MCU) program is held as an instrument for early detection of PTM, mandated by Minister of Manpower and Transmigration Regulation No. 02/1980, PP no. 28/2024, and Law no. 17/2023.

Data from the 2024 DEDICATION Program (Early Detection of Employees Before Indication) which reached 1,063 employees from 22 work units revealed a very worrying epidemiological picture: 89.6% of participants were detected as having at least one clinical disorder related to PTM. This high prevalence—far exceeding the national average—underscores the urgency of a structured and economical MCU program (DEDICATION Medical Records Data, 2024).

The DPR RI Main Clinic Development Team (2025) has formulated four MCU package scenarios (Plan I–IV) with an estimated cost of IDR 1.3 million to IDR 2.5 million per participant. However, not a single academic study has formally calculated the program's economic efficiency. This lacuna is the main justification for this research: the application of Cost-Effectiveness Analysis (CEA) to provide a scientific basis for MCU budget allocation decision making.

CEA is a health economic evaluation method that compares program costs with the resulting clinical outcomes (Drummond et al., 2015). This research will produce ACER (Average Cost-Effectiveness Ratio), ICER (Incremental Cost-Effectiveness Ratio) and ROI (Return on Investment) values for NCD prevention for the four MCU scenarios, as well as analyzing policy implementation factors using the Edward III (1980) framework.

Literature Review

Cost-Effectiveness Analysis (CEA) in Health Services

Cost-Effectiveness Analysis (CEA) is an economic evaluation method that systematically identifies, measures, and compares the costs and health consequences of two or more alternative programs (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2015). In contrast to Cost-Benefit Analysis which converts benefits into monetary values, CEA uses concrete and medically meaningful clinical outcome units — such as the number of NCD cases detected — as the denominator of the efficiency ratio.

Neumann et al. (2016) distinguish two main indicators of CEA: Average Cost-Effectiveness Ratio (ACER) which measures the average efficiency of a program, and Incremental Cost-Effectiveness Ratio (ICER) which measures marginal efficiency — the additional cost of obtaining one additional unit of outcome compared to other alternatives. The ICER value is compared with the WHO willingness-to-pay (WTP) threshold, namely 1–3× GDP per capita of the country concerned.

Gold, Siegel, Russell, and Weinstein (1996) assert that CEA provides the most comprehensive framework for evaluating preventive programs because it integrates efficiency and effectiveness dimensions in a single ratio that can be communicated to non-technical stakeholders. In the Indonesian context, the WTP threshold used is IDR 66 million (1× GDP per capita 2024) to IDR 198 million (3× GDP per capita) per case of detected NCDs.

Activity-Based Costing in MCU Cost Calculation

Activity-Based Costing (ABC) is a cost calculation method that allocates overhead costs based on actual activities that consume resources, not just a simple proportion of total costs (Finkler, Smith, & Calabrese, 2019). In the context of an MCU, ABC enables more accurate unit cost calculations by mapping each activity — from registration to delivery of results — and assigning cost drivers that best reflect resource consumption patterns at each stage.

The advantage of ABC over traditional methods lies in its ability to identify value-added activities and resource-intensive activities (Finkler et al., 2019). In this study, ABC was applied to calculate four cost components: direct medical costs (reagents, consumables, equipment depreciation), non-medical direct costs (proportional honorarium for health workers, administration), clinic overhead costs (electricity, water, buildings), and opportunity costs of participant time.

MCU Policy Implementation Factors (Edward III Framework)

George C. Edward III (1980) identified four determinants of successful policy implementation: (1) Communication — clarity, consistency, and accuracy of policy transmission to implementers and targets; (2) Resources — adequacy of human resources, budget, facilities and information; (3) Disposition — commitment, motivation and attitude of implementers towards the policy; and (4) Bureaucratic Structure — completeness of SOPs and effectiveness of coordination between units.

Donabedian (1966) in his health service evaluation framework places resources in the structural layer which is the foundation for the quality of the process and program outcomes. Nugroho, Siregar, and Harahap (2022) found that 78% of government agencies did not have structured MCU follow-up, while Pratama and Wahyuni (2021) reported that MCU follow-up only occurred in 41% of detected diabetes cases — a finding that underscores the need for comprehensive implementation analysis.

Return on Investment (ROI) Corporate Health Program

Chapman (2012) in a meta-evaluation of 62 corporate wellness programs found an average ROI of 327% or 3.27:1 — every Rp. 1,000 investment resulted in savings of Rp. 3,270 in avoided medical costs. These savings include reducing inpatient treatment costs for NCDs, reducing absenteeism due to illness, and increasing work productivity.

Goettler, Grosse, and Sonntag (2017) in a systematic review of the economic impact of obesity found that overweight employees were 1.38 times more likely to be absent from work due to illness and 1.66 times more likely to experience decreased performance when present. Considering the prevalence of central obesity of 69.0% among employees of the Secretariat General of the DPR RI (2024 DEDICATION data), the potential for savings through early detection and MCU intervention is very significant.

RESEARCH METHODS

Research Design

This research uses a mixed methods approach with a sequential explanatory design, where the quantitative component is carried out first, followed by the qualitative component which functions to deepen and explain the initial findings. The quantitative component is retrospective descriptive-analytical based on secondary data; The qualitative component uses a phenomenological-descriptive approach through in-depth semi-structured interviews.

Location and Time of Research

The research was carried out at the DPR RI Main Clinic, DPR RI Building Complex, Jalan Jenderal Gatot Subroto, Senayan, Central Jakarta. The research time span is July–December 2026, including instrument preparation, data collection, analytical processing, and reporting.

Population and Sample

Quantitative data sources consist of three groups: (1) Medical records for MCU echelon II–IV programs (n=208) with total sampling/census; (2) DEDICATION 2024 Program medical records (n=1,063) as a comparison for NCD prevalence; and (3) Financial and personnel data for 2,786 active employees of the Secretariat General of the DPR RI as of January 2026 as a basis for cost projections.

Medical record inclusion criteria: recorded in the DPR RI Main Clinic information system for the period 2022–2024, contains examination results of at least four main NCD parameters (blood pressure, lipid profile, fasting blood sugar, and anthropometry), and is equipped with employee identity data that allows echelon classification. Exclusion criteria: incomplete medical records (missing data >2 PTM parameters) or do not match active employment status.

Qualitative informants were selected by purposive sampling from 9 groups: clinic heads, MCU implementing doctors (2 people), clinic financial managers, officials from the Human Resources Section of the Secretariat General of the DPR RI, officials from the Finance Section of the Secretariat General of the DPR RI, supporting health workers (2 people), and health economics experts (if needed). Data collection was stopped when information saturation was reached.

Data Collection

Data is collected through four complementary channels: (1) Review of financial documents (invoices, expenditure reports, 2022–2024 payroll data); (2) Review MCU and DEDICATION 2024 medical records using a standardized data extraction form; (3) In-depth semi-structured interviews based on Edward III's (1980) framework with key informants; and (4) Time-and-motion study to determine cost drivers for each MCU activity.

Data Analysis

Quantitative data analysis comprised five stages: (a) calculation of the unit cost per MCU participant using the Activity-Based Costing (ABC) method through four steps: activity identification, cost driver determination, cost allocation by activity, and calculation of the unit cost per participant; (b) calculation of the Average Cost-Effectiveness Ratio (ACER) = Total MCU Cost ÷ Total Detected NCD Cases; (c) calculation of the Incremental Cost-Effectiveness Ratio (ICER) = ΔCost ÷ ΔEffectiveness among Plan I–IV scenarios; (d) scenario-based cost projection with 5–20% economies of scale adjustments; and (e) one-way sensitivity analysis using assumption variations of ±10% to ±30%, presented in a tornado diagram.

ROI analysis employed the following formula:

[(Estimated NCD Cost Savings − Total MCU Cost) ÷ Total MCU Cost] × 100%, where the estimated savings were calculated based on the 2023 Ministry of Health INA-CBG reimbursement rates for NCD management over a projected period of 3–5 years.

Qualitative data were analyzed using Braun and Clarke's (2006) six-step thematic analysis. Data validity was ensured through source triangulation, method triangulation, investigator triangulation, and member checking. All quantitative data were processed using Microsoft Excel and SPSS version 27, while qualitative data were analyzed using NVivo version 12.

RESULTS AND DISCUSSION

Epidemiological Profile of Non-Communicable Diseases (NCDs) among Employees of the Secretariat General of the House of Representatives of the Republic of Indonesia

The 2024 DEDIKASI Program, which covered 1,063 employees from 22 organizational units, produced a highly concerning epidemiological profile. A total of 952 participants (89.6%) were identified as having at least one clinical abnormality related to non-communicable diseases (NCDs), a figure far exceeding the national average. Table 1 presents the detailed clinical findings of the 2024 DEDIKASI Program.

Table 1. Summary of Clinical Findings from the 2024 DEDIKASI Program at the DPR RI Main Clinic (N = 1,063)

Clinical Condition Detected	Number (n)	Proportion (%)	Risk Category
Central Obesity (LP > 90 cm men / > 80 cm women)	734	69.0%	Very high
Hypertension Grade 1 & 2 (BP ≥140/90 mmHg)	645	60.7%	Very high
Hypercholesterolemia (Cholesterol >200 mg/dL)	559	52.6%	Tall
Overweight (BMI 23.0–24.9 kg/m²)	415	39.0%	Alert
General Obesity (BMI ≥25.0 kg/m²)	296	27.8%	Tall
Hyperglycemia/Pre-Diabetes (GD ≥140 mg/dL)	106	10.0%	Need Attention
Total Participants with ≥1 Clinical Abnormality	**952**	89.6%	CRITICAL

Source: DEDIKASI Medical Record Data, DPR RI Main Clinic (2024), processed by the authors.

The prevalence of central obesity (69.0%), which far exceeds the national average (30.8% according to the 2018 Basic Health Research [Riskesdas]), reflects the high NCD risk profile among employees of the Secretariat General of the DPR RI. Occupational characteristics dominated by sedentary work, high work pressure, and easy access to subsidized cafeterias constitute contextual factors contributing to this condition. Goettler et al. (2017) emphasized that such a high prevalence of obesity has the potential to generate substantial productivity losses through a 1.38-fold increase in absenteeism and a 1.66-fold reduction in presenteeism compared with employees of normal body weight.

The prevalence of hypertension (60.7%) is almost twice the national prevalence (34.1%), while the prevalence of dyslipidemia (52.6%) indicates the predominance of cardiovascular risk factors

within this population. These conditions are generally asymptomatic during their early stages; therefore, without a structured MCU program, most cases would only be detected after serious complications have occurred, at which point treatment costs become substantially higher.

MCU Package Scenarios: Plan I–IV

The Drafting Team of the DPR RI Main Clinic (2025) formulated four MCU package scenarios with different target participants and estimated costs. Table 2 presents a comprehensive comparison of the four scenarios.

Table 2. Comparison of the Four MCU Package Scenarios at the DPR RI Main Clinic

Type of Examination	**Plan I Basic**	**PlanII Moderate**	**PlanIII Advance A**	**Plan IV Advance B**
Physical Examination (General Practitioner)	✓	✓	✓	✓
Physical Examination (Internal Medicine Specialist)	—	—	✓	—
Dental and Oral Examination	✓	✓	✓	✓
Eye Examination (Vision, Refraction)	✓	✓	✓	✓
ENT Examination (ENT Specialist)	—	—	✓	—
Cardiac Examination (ECG)	✓	✓	✓	—
Treadmill Test	—	✓	✓	—
Mental Health Examination (Psychiatrist)	—	—	✓	—
Obstetrics and Gynecology Examination	—	✓	✓	—
Radiology (Chest X-ray + Panoramic X-ray)	✓	✓	✓	✓
Complete Blood Laboratory Tests	✓	✓	✓	✓
Lipid Profile (Total Cholesterol, HDL, LDL, Triglycerides)	✓	✓	✓	✓
Blood Glucose (Fasting Blood Glucose, 2-Hour Postprandial Blood Glucose, HbA1c)	✓	✓	✓	—
Kidney Function (Urea, Creatinine, Uric Acid)	✓	✓	✓	—
Liver Function (SGOT, SGPT)	✓	✓	✓	—
Estimated Cost (IDR/participant)	**1,700,000**	**2,000,000**	**2,500,000**	**1,300,000**
Target Participants	**208 employees (Echelon II–IV)**	**208 employees (Echelon II–IV)**	**19 employees (Echelon II)**	**2,573 employees (other civil servants)**

Source: Drafting Team of the DPR RI Main Clinic (2025), processed by the authors.

Plan I (Basic, IDR 1,700,000 per participant) and Plan II (Moderate, IDR 2,000,000 per participant) are intended for 208 Echelon II–IV employees, with examination packages covering all essential NCD parameters. Plan III (Advance A, IDR 2,500,000 per participant) includes more comprehensive specialist examinations for 19 Echelon II officials. Plan IV (Advance B, IDR 1,300,000 per participant) is designed to cover 2,573 non-echelon employees with a more concise examination package while still including physical examinations, eye examinations, dental examinations, radiological examinations, and basic laboratory tests.

Overall, the four scenarios require substantially different budget allocations. If all 2,786 employees are covered through a combination of these scenarios, the total budget requirement may

range from several hundred million rupiah to nearly seven billion rupiah. Without a formal Cost-Effectiveness Analysis (CEA), selecting the most appropriate scenario cannot be conducted objectively or based on empirical evidence.

Cost-Effectiveness Analysis Framework

This study operationalizes Cost-Effectiveness Analysis (CEA) through eight key variables measured systematically, as presented in Table 3. The dependent variables include the Average Cost-Effectiveness Ratio (ACER), the Incremental Cost-Effectiveness Ratio (ICER), and Return on Investment (ROI) as indicators of program efficiency. The independent variables consist of four components of MCU costs (X1), four indicators of NCD detection effectiveness (X2), four Edward III policy implementation factors (X3), and projections for the expansion of the MCU program (X4).

Table 3. Research Variables and Operationalization of the CEA Measurement for the MCU Program

Variable	Indicator	Formula/Definition	Data Source
ACER (Y1)	Cost per detected NCD case	Total MCU Cost ÷ Total Detected NCD Cases	Clinic financial reports + MCU medical records
ICER (Y2)	Additional cost per additional detected NCD case	ΔCost ÷ ΔEffectiveness (between Plan I–IV scenarios)	Longitudinal cost and effectiveness data (2022–2024)
ROI (Y3)	Return on investment in NCD prevention	[(Savings − MCU Cost) ÷ MCU Cost] × 100%	Ministry of Health INA-CBG tariffs + MCU program costs
Direct Medical Costs (X1.1)	Cost of reagents, consumables, and equipment depreciation	Review of procurement invoices + purchasing reports	Clinic financial reports (2022–2024)
Non-Medical Costs (X1.2)	Proportional honoraria for healthcare personnel and administration	Payroll × proportion of MCU working time (time-motion study)	Payroll data from the Human Resources Bureau of the Secretariat General of the DPR RI
Opportunity Cost (X1.4)	Productivity loss of MCU participants	Average hourly salary × MCU duration per participant (hours)	Payroll data + MCU duration observations
Hypertension Detection (X2.2)	Proportion of participants diagnosed with hypertension	n Hypertension (BP ≥140/90 mmHg) ÷ Total N × 100%	Medical records of MCU participants (Echelon II–IV)
Dyslipidemia Detection (X2.3)	Proportion of participants diagnosed with dyslipidemia	n Dyslipidemia (Cholesterol >200 mg/dL, etc.) ÷ Total N × 100%	Medical records of MCU participants (Echelon II–IV)

Source: Adapted from Drummond et al. (2015) and Neumann et al. (2016).

The use of the Activity-Based Costing (ABC) method in calculating unit costs enables more accurate cost allocation than traditional costing methods. The time-and-motion study to be conducted will generate time-based cost driver data for each MCU activity—from registration (±15 minutes), blood specimen collection (±20 minutes), general practitioner physical examination (±30 minutes), electrocardiography (±15 minutes), radiological examination (±30 minutes), to post-examination consultation (±20 minutes).

The calculation of participants' opportunity cost is a component that is frequently overlooked in MCU cost studies in Indonesia; however, it is methodologically essential to avoid underestimating the total program cost (Gold et al., 1996). Based on the average salary of employees of the Secretariat General of the DPR RI, which can be extracted from payroll data, and an estimated MCU duration of 3–5 hours per participant, this opportunity cost may contribute substantially to the overall cost of the program.

Cost-Effectiveness Projections and Policy Implications

Referring to the NCD prevalence data (89.6%) and the estimated costs of the Plan I–IV MCU packages, this study anticipates an ACER value that is well below the WHO willingness-to-pay (WTP) threshold. With the estimated cost of Plan I at IDR 1,700,000 per participant and an NCD detection prevalence of 89.6%, the projected ACER is approximately IDR 1,897,546 per detected NCD case

(IDR 1,700,000 ÷ 0.896). This figure is substantially below the WTP threshold of IDR 66 million (1× Indonesia's GDP per capita in 2024), indicating that the MCU program is highly cost-effective even before the actual data are calculated.

Hypothesis Ha2 regarding the effect of economies of scale receives strong theoretical support. Expanding the MCU program from 208 participants (Plan I/II) to 2,573 participants (Plan IV) has the potential to reduce unit costs through broader distribution of fixed costs and bulk reagent price negotiations. The literature indicates a potential reduction in unit costs of 15–25% with a significant increase in participant volume (Drummond et al., 2015).

The ROI analysis for NCD prevention using the Ministry of Health's 2023 INA-CBG reimbursement rates projects substantial potential cost savings. For illustration, the average hospitalization cost for one episode of uncontrolled hypertension ranges from IDR 3–5 million per case, while the hospitalization cost for one episode of diabetes mellitus ranges from IDR 5–15 million. If the MCU program successfully prevents 10% of detected NCD cases from progressing to complications within 3–5 years, the resulting cost savings may exceed the total investment in the MCU program, thereby generating a positive ROI consistent with Chapman's (2012) findings of an average ROI of 327% for corporate health programs.

This study reinforces findings from both global and national literature indicating that workplace-based MCU programs constitute a cost-effective investment in the control of non-communicable diseases (NCDs). Compared with the study by Sari and Sulistiadi (2020), which calculated the average cost of periodic MCU at IDR 850,000 per participant in a public hospital in Jakarta without conducting a formal Cost-Effectiveness Analysis (CEA), the present study provides a more comprehensive methodological contribution through the calculation of ACER, ICER, and ROI.The uniqueness of this study lies in its specific institutional setting, namely a clinic operating within the highest legislative institution of the country. The target population, employees of the Secretariat General of the DPR RI, exhibits a significantly higher NCD risk profile than the national average while also having better access to institutional healthcare facilities. This situation creates a strategic intervention opportunity: aggressive early detection through a comprehensive MCU program has the potential to prevent the progression of NCDs before they require long-term specialist treatment, which is considerably more expensive.

The limitations of this study include: (1) its retrospective nature, which relies on the completeness of historical medical records; (2) the potential for recall bias in qualitative interviews; and (3) the unavailability of actual treatment cost data for specific NCDs among employees of the Secretariat General of the DPR RI, resulting in ROI savings estimates based on the national INA-CBG reimbursement rates, which may not fully reflect the institution's specific conditions. These limitations will be addressed through one-way sensitivity analysis and data triangulation from multiple sources.

From the perspective of Islamic values, this study embodies the principle of *itqan* (excellence in work), as emphasized in the Hadith narrated by Al-Baihaqi. The management of an MCU program that is measurable, accountable, and based on empirical evidence represents a form of *amanah* (trustworthiness) in managing public health resources. Justice in the allocation of healthcare services, as mandated in the Qur'an, Surah Al-Ma'idah (5:8), requires that all employees of the Secretariat General of the DPR RI, regardless of their position, are entitled to access quality and affordable MCU services.

CONCLUSIONS

This study aims to produce a comprehensive cost-effectiveness analysis of the MCU program at the DPR RI Main Clinic. Based on the methodological framework that has been developed, this study is hypothesized to produce the following findings:

- The MCU program at the DPR RI Main Clinic is highly cost-effective, with an ACER value far below the WHO willingness-to-pay (WTP) threshold (IDR 66 million per detected NCD case), considering the very high prevalence of NCD detection (89.6%) among employees of the Secretariat General of the DPR RI.
- The scenario with broader participant coverage (Plan IV, n = 2,573) produces a lower ACER than the echelon-only scenarios (Plan I/II, n = 208) due to the economies of scale effect in the distribution of fixed costs.
- The ROI of the MCU program is positive, indicating that the savings in avoidable NCD treatment costs exceed the total program investment over a projected period of 3–5 years, consistent with Chapman's (2012) meta-evaluation, which reported an average ROI of 327% for corporate health programs.
- The policy implementation factors that most significantly influence the efficiency of the MCU program are the availability of resources (specialist healthcare personnel, calibrated medical equipment, and timely budget disbursement) and the completeness of the bureaucratic structure (Standard Operating Procedures and inter-unit coordination).

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