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Community-Based Health Screening: Assessment of Oxygen Saturation (SpO_2), Heart Rate, and Body Temperature in RT 005 RW IV, Kelurahan Gondoriyo, Ngaliyan, Semarang

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ABSTRACT

Vital signs, namely oxygen saturation (SpO_2), heart rate (HR), and body temperature, are fundamental physiological indicators of overall health status. Their periodic monitoring in the general population supports early identification of oxygenation disorders, cardiovascular conditions, and infection or inflammation before these progress to more serious conditions. This research-based community service activity carried out a free vital-sign screening for residents of RT 005 RW IV, Kelurahan Gondoriyo, Ngaliyan, Semarang, on 28 June 2026, using a pulse oximeter for SpO_2 and HR and a non-contact infrared thermometer for body temperature. Twenty community members were screened, with duplicate SpO_2 and HR measurements taken for each participant; the second reading of each was used as the analysis reference after the first-attempt readings were assessed as reflecting an initial probe signal-stabilization phase. Results showed a mean SpO_2 of 96.8% (range 79–100%), with 90% (18 of 20 participants) within the normal range (≥95%) and one participant showing severe hypoxemia (79%) requiring urgent referral. Mean HR was 59.2 beats per minute (range 35–100), with only 35% (7 of 20) within the standard resting range of 60–100 bpm; two participants showed severe bradycardia (35 and 37 bpm) requiring immediate electrocardiographic evaluation. Mean body temperature was 35.65°C (range 34.5–36.3°C), a pattern consistent with the known sensitivity of non-contact infrared thermometry to outdoor ambient conditions. The activity produced individualized referral recommendations for participants with critical findings and supports periodic, six-monthly community vital-sign screening, particularly for residents above 40 years of age.

Keywords: Vital Signs Screening; Pulse Oximetry; Oxygen Saturation; Bradycardia; Community Health Service

Introduction

Vital signs are basic physiological parameters that reflect the overall function of the human body. Oxygen saturation (SpO_2), heart rate (HR), and body temperature are among the vital signs most commonly used as early indicators of a person's health status. Regular monitoring of these three parameters in the general population allows early identification of oxygenation disorders, cardiovascular conditions, and infection or inflammation that may develop into serious conditions if left undetected.

Community-based screening extends this early-detection function beyond routine clinical settings and into residential neighborhoods, where many health conditions otherwise remain undetected until they become symptomatic. In Indonesia, community-based approaches to early detection, complementing government-run integrated health posts (Posbindu) that primarily target older residents, have shown potential for reaching a broader segment of the population and increasing health awareness (Siregar et al., 2021). Vital-sign screening at the neighborhood (RT/RW) level represents one practical form of this approach, particularly when carried out by trained personnel using accessible, non-invasive instruments.

Oxygen saturation below 95% is generally considered outside the normal range and warrants further clinical attention (World Health Organization [WHO], 2011), while a resting heart rate of 60–100 beats per minute is considered within normal limits for adults (Jarvis, 2015). Normal body temperature varies by measurement method and site, with peripheral measurements typically running lower than oral or core measurements (Sund-Levander et al., 2002). Non-contact infrared thermometers, increasingly used for their speed and hygienic advantages, are also known to be more sensitive than contact methods to ambient conditions such as outdoor air temperature and airflow, which can systematically shift their readings (Zhao & Bergmann, 2023).

Recognizing the value of accessible vital-sign screening at the community level, the Department of Physics, Faculty of Science and Technology, Universitas Islam Negeri Walisongo Semarang, organized a research-based community service activity for residents of RT 005 RW IV, Kelurahan Gondoriyo, Ngaliyan, Semarang, on 28 June 2026. The activity aimed to (1) document the SpO_2 , heart rate, and body temperature results of all screening participants completely and honestly; (2) identify participants with values outside the normal range who require medical follow-up; (3) provide an overview of the vital-sign status of the RT 005 RW IV community; and (4) develop data-based recommendations for referral and further health monitoring.

Methods

This community service activity was implemented in three stages: preparation, implementation, and evaluation.

Stage I: Preparation

The preparation stage involved coordination between the Department of Physics team of Universitas Islam Negeri Walisongo Semarang and the leadership of RT 005 RW IV, Kelurahan Gondoriyo. The RT 005 RW IV administration provided the screening venue and facilities, while consumption for participants and presenters was provided by the Department of Physics. Measurement instruments were prepared, consisting of a pulse oximeter for SpO_2 and HR measurement and a non-contact infrared thermometer for body temperature measurement. The activity team was organized by role: an activity coordinator, resource persons responsible for health education, practitioners responsible for conducting the measurements, and general assistants supporting logistics on the day of the activity.

Stage II: Implementation

The activity was conducted on Sunday, 28 June 2026, from 08.00 WIB until completion, at Beringin Forest Park, Gondoriyo, Ngaliyan, Semarang. The program opened at 08.00–08.10, followed by welcoming remarks from the chair of RT 005 RW IV at 08.10–08.20. The core session, from 08.20–09.00, consisted of an explanation of SpO_2, heart rate, and body temperature measurement and how to interpret the results, delivered by the resource persons. From 09.00 until completion, the practitioner team conducted free health screening for participants, measuring SpO_2 and HR using the pulse oximeter and body temperature using the non-contact infrared thermometer, followed by discussion for participants whose results required further explanation. Twenty residents of RT 005 RW IV completed the screening, supported by lecturers and students of the Department of Physics as facilitators. For each participant, SpO_2 and HR were measured twice in succession using the pulse oximeter, and body temperature was measured using the non-contact infrared thermometer.

Stage III: Evaluation and Data Analysis

The recorded measurements were reviewed for data quality before analysis. The first-attempt SpO_2 and HR readings included a number of values consistent with the initial signal-acquisition phase of the pulse oximeter probe, a known source of transient inaccuracy that standard oximetry guidance addresses by waiting for the signal to stabilize before a reading is recorded (World Health Organization, 2011). For this reason, the second SpO_2 and HR reading for each participant was used as the analysis reference. For body temperature, a second, later reading returned a number of values outside any physiologically plausible range and was excluded from analysis; the first temperature reading, which fell within a plausible range for all participants, was used instead. Table 1 shows the normal reference ranges applied to classify participants' results.

Table 1. Normal reference values used to classify screening results

Parameter	Normal range applied	Source
SpO_2 (oxygen saturation)	≥95%	World Health Organization (WHO), 2011

Parameter	Normal range applied	Source
Resting heart rate (HR)	60–100 beats/minute	Jarvis, 2015
Body temperature (non-contact infrared)	≥36.0°C	Sund-Levander et al., 2002

Results and Discussion

The community vital-sign screening was completed as planned, with 20 residents of RT 005 RW IV, Kelurahan Gondoriyo, participating in the SpO_2 , heart rate, and body temperature measurements. Figure 1 show the implementing team with the the SpO_2, heart rate, and body temperature measurements used during the screening.

Figure 1. The implementing team with the the SpO_2, heart rate, and body temperature measurements used during the screening

Oxygen Saturation (SpO_2) Findings

Across the 20 participants, second-reading SpO_2 values ranged from 79% to 100%, with a mean of 96.8% (Table 2). Eighteen of the 20 participants (90%) recorded SpO_2 within the normal range (≥95%; WHO, 2011). One participant (No. 17) recorded an SpO_2 of 90%, placing this result in a borderline category warranting re-measurement, and one participant (No. 19) recorded an SpO_2 of 79%, indicating severe hypoxemia and requiring urgent referral for evaluation of pulmonary or cardiac function (Table 3).

Heart Rate Findings

Second-reading HR values ranged from 35 to 100 beats per minute, with a mean of 59.2 beats per minute. Only 7 of the 20 participants (35%) fell within the standard resting range of 60–100 beats per minute (Jarvis, 2015). Eight participants (40%) recorded borderline values of 50–59 beats per minute, three participants (15%) recorded bradycardia in the 40–49 range, and two participants (10%, No. 11 and No. 20) recorded severe bradycardia below 40 beats per minute (37 and 35 beats per minute respectively), both flagged as priority referrals for electrocardiographic confirmation (Table 3).

Figure 2. Vital sign measurement using the pulse oximeter and non-contact infrared thermometer during the screening session

Body Temperature Findings

Body temperature measurements ranged from 34.5°C to 36.3°C, with a mean of 35.65°C. Eight participants (40%) recorded temperatures within the normal range used for this activity (≥36.0°C), while 11 participants (55%) fell in a lower range of 35.0–35.9°C and one participant (No. 18) recorded 34.5°C, within a hypothermic range that was flagged for re-measurement. Because these readings were obtained with a non-contact infrared thermometer in an open-air park setting, the generally low readings most plausibly reflect the known sensitivity of this measurement method to outdoor ambient conditions, including air temperature and airflow at the skin surface, rather than true core hypothermia in most participants (Zhao & Bergmann, 2023). The one participant recording 34.5°C was nonetheless flagged for re-measurement and, if confirmed, clinical evaluation, consistent with the activity's precautionary approach to values outside the expected range.

Table 2. Summary of vital sign measurements (n = 20)

Parameter	Mean	Range	Category	n (%)
			Normal (≥95%)	18 (90%)
SpO_2 (%)	96.8	79–100	Attention (90–94%)	1 (5%)
			Low (<90%)	1 (5%)
			Normal (60–100)	7 (35%)
HR (bpm)	59.2	35–100	Borderline (50–59)	8 (40%)
			Bradycardia (40–49)	3 (15%)
			Severe bradycardia (<40)	2 (10%)
			Normal (≥36.0)	8 (40%)
Body temperature (°C)	35.65	34.5–36.3	Low (35.0–35.9)	11 (55%)
			Hypothermic (<35.0)	1 (5%)

Measurement Reliability and Methodological Considerations

A notable feature of the screening data is the difference between first- and second-attempt SpO_2 and HR readings for many participants. The majority of first-attempt SpO_2 readings and first-attempt HR readings fell into narrow, comparatively extreme bands (SpO_2 as low as 69%, and HR values repeatedly at or near 97 to 100 beats per minute) that are physiologically implausible as a stable community-wide pattern, and are more consistent with the initial signal-acquisition period of the pulse oximeter probe, during which readings can be unreliable until the device detects a stable pulsatile signal (World Health Organization, 2011). For this reason, the second reading of SpO_2 and HR was treated as the more reliable value for each participant and used throughout the analysis above. A second body-temperature reading was also collected but returned values outside any physiologically plausible range and was excluded from analysis; only the first temperature reading, which fell within a plausible range for all participants, was retained. This pattern points to a practical lesson for future screening activities: allowing the pulse oximeter probe to stabilize for a minimum period before recording a reading, as recommended in standard pulse oximetry training guidance (World Health Organization, 2011), would likely reduce the need for duplicate measurements and improve first-pass data quality.

Table 3. Priority follow-up cases identified from the screening

Priority	Participant	Finding	Value	Recommended follow-up
1	No. 20	HR (2nd reading)	35 bpm	Immediate referral to a health facility for severe bradycardia; ECG evaluation recommended
1	No. 11	HR (2nd reading)	37 bpm	Immediate referral to a health facility for severe bradycardia; ECG evaluation recommended
1	No. 19	SpO_2 (2nd reading)	79%	Re-verify measurement; if confirmed, refer for pulmonary/cardiac function evaluation
2	No. 17	SpO_2 (2nd reading)	90%	Repeat measurement; consult a physician if the result persists

Priority	Participant	Finding	Value	Recommended follow-up
2	No. 18	Body temperature	34.5°C	Repeat measurement; evaluate for hypothermia if the result is confirmed
3	12 participants	HR (2nd reading) < 60 bpm	35–59 bpm	Clinical context needed; routine monitoring recommended

Figure 3. Documentation of the health screening activity with the practitioner team

Comparison with Literature

The overall oxygenation status observed in this community, with 90% of participants within the normal SpO_2 range, is consistent with a generally healthy population under the WHO (2011) threshold used for screening. The heart rate findings are more notable: with only 35% of participants within the standard 60–100 beats-per-minute range (Jarvis, 2015), most of this community sample recorded resting heart rates below the conventional threshold. This finding should be interpreted with caution given the field conditions and single-measurement design of this screening. It nonetheless reinforces the value of community-based screening as a means of flagging individuals for further clinical evaluation that would not otherwise occur (Siregar et al., 2021). The temperature findings align with documented limitations of non-contact infrared thermometry outside controlled indoor conditions, where measurement bias relative to core or oral reference temperatures has been reported in field and outdoor settings (Zhao & Bergmann, 2023).

Challenges and Limitations

Several limitations should be considered when interpreting these results. The sample size (n = 20) is small and reflects only the residents who attended the screening on a single day, so the findings should not be generalized to the broader RT 005 RW IV population or beyond. Two participants (No. 14 and No. 15) did not have age data recorded. The screening was a single time-point assessment; vital signs, particularly heart rate, can vary with recent activity, posture, and time of day, none of which were standardized or recorded in this activity. Body temperature was measured with a non-contact infrared thermometer in an outdoor setting without controlling for wind, direct sunlight, or time since participants' arrival, limiting the comparability of these readings to clinical, indoor temperature measurements. Finally, no confirmatory clinical examination, such as electrocardiography, was performed on-site, so the bradycardia and hypoxemia findings identified here represent screening indications requiring clinical confirmation rather than diagnoses.

Implications for Practice

These findings support several practical recommendations. Participants with critical findings, HR below 40 beats per minute or SpO_2 below 90%, should be referred to a health facility as soon as possible for evaluation, including electrocardiography and chest imaging where clinically indicated. The pulse oximeter measurement protocol should be revised to require a minimum stabilization period, such as waiting at least 30 seconds after the probe signal stabilizes before recording a reading, to reduce the instability observed in first-attempt readings. Periodic screening, for example every six months, is recommended for the RT 005 RW IV community, with particular attention to residents above 40 years of age. Given the value of this activity in identifying participants who benefited from referral, continuing this collaboration between the Department of Physics and RT 005 RW IV as a recurring community health program would extend these benefits over time.

Conclusion

This community service activity successfully screened the oxygen saturation, heart rate, and body temperature of 20 residents of RT 005 RW IV, Kelurahan Gondoriyo, Ngaliyan, Semarang, using a pulse oximeter and a non-contact infrared thermometer. Most participants, 90%, recorded oxygen saturation within the normal range, indicating generally adequate oxygenation status in this community sample, while one participant with severe hypoxemia (SpO_2 79%) and one participant with a borderline result (SpO_2 90%) were identified for further evaluation. Heart rate findings were more notable, with only 35% of participants within the standard resting range and two participants recording severe bradycardia (35 and 37 beats per minute) requiring immediate referral and electrocardiographic confirmation. Mean body temperature of 35.65°C most plausibly reflects the characteristics of non-contact infrared measurement in an open-air setting, though the one participant recording 34.5°C was flagged for re-measurement and possible clinical evaluation.

Beyond these individual findings, the activity highlighted a practical measurement lesson: first-attempt pulse oximeter readings for many participants reflected an initial signal-instability phase, underscoring the importance of allowing the probe signal to stabilize before recording results in future screenings. The activity produced individualized recommendations for participants requiring follow-up and supports the value of continued, periodic vital-sign screening, recommended here at a six-monthly interval, for the RT 005 RW IV community, particularly residents above 40 years of age. This activity demonstrates the contribution that university-based, research-informed community service can make to community health awareness and early detection at the neighborhood level.

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Conflicts of Interest

The authors declare no conflicts of interest.

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