Preferences and Acceptance of Colorectal Cancer Screening in Thailand

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Abstract

Colorectal cancer (CRC) is now common in Thailand with an increase in incidence over time. Health authorities are planning to implement a nationwide CRC screening program using fecal immunochemical test (FIT) as a primary screening tool. This study aimed to estimate preferences and acceptance of FIT and colonoscopy, explore factors influencing the acceptance, and investigate reasons behind choosing and rejecting to screen before the program was implemented. Patients aged 50-69, visiting the primary care unit during the study period, were invited to join this study. Patients with a history of cancer or past CRC screening were excluded. Face-to-face interviews were conducted. Subjects were informed about CRC and the screening tests: FIT and colonoscopy. Then, they were asked for their opinions regarding the screening. The total number of subjects was 437 (86.7% response rate). Fifty-eight percent were females. The median age was 58 years. FIT was accepted by 74.1% of subjects compared to 55.6% for colonoscopy. The acceptance of colonoscopy was associated with perceived susceptibility to CRC and family history of cancer. No symptoms, unwilling to screen, healthy, too busy and anxious about diagnosis were reasons for refusing to screen. FIT was preferred for its simplicity and non-invasiveness compared with colonoscopy. Those rejecting FIT expressed a strong preference for colonoscopy. Subjects chose colonoscopy because of its accuracy; it was refused for the process and complications. If the screening program is implemented for the entire target population in Thailand, we estimate that 106,546 will have a positive FIT, between 8,618 and 12,749 identified with advanced adenoma and between 2,645 and 3,912 identified with CRC in the first round of the program.

Keywords: Colorectal cancer - screening - preference - acceptance - Thailand
their dependants, the Social Security Scheme (SSS) for private employees in the formal sector and the Universal Coverage Scheme (UCS) for the rest of the population (Bureau of Policy and Strategy, 2009; Hanvoravongchai, 2013). UCS is the first scheme to adopt the screening program (National Cancer Institute, 2013).

FIT works by detecting occult blood in the stool, a proxy for presence of adenoma and cancer. Nevertheless, a number of conditions can cause a positive result. Therefore, individuals with a positive result require colonoscopy for their definitive diagnosis. FIT is a novel stool test; it requires neither diet restriction nor bowel preparation. No direct complication from FIT has been reported. Stool tests are typically done on an annual basis (U. S. Preventive Services Task Force, 2008; Shim et al., 2010; International Cancer Screening Network, 2014). Colonoscopy involves inserting an endoscope into the colon via the rectum. It requires one to three days of bowel preparation with complications varying from mild discomfort to bowel perforation (which can be fatal). Colonoscopy is performed once in 10 years (U. S. Preventive Services Task Force, 2008). Besides its diagnostic capability for cases with a positive stool test, colonoscopy can be employed as a first-line screening test. The sensitivity of FIT is 20.0-59.0% for advanced adenoma and 65.8-94.1% for cancer. This compares with sensitivity of colonoscopy between 88.2-100.0% for both advanced adenoma and cancer. The specificity of FIT for CRC is between 87.5-94.6% compared to 100.0% for colonoscopy (Rex et al., 1997; Nakama et al., 2001; Pickhardt et al., 2003; Bressler et al., 2007; Levi et al., 2007). Both FIT and colonoscopy are regarded as cost-effective screening tests (U. S. Preventive Services Task Force, 2008; Barouni et al., 2012).

Whereas sensitivity and specificity indicate effectiveness of each screening test, an uptake rate dictates effectiveness of the overall screening program. National screening programs in Canada, US, UK, Italy, Korea and Singapore experienced challenges of low uptake despite differences in program administration, screening tests offered and health care financing (Choi et al., 2010; Lisi et al., 2010; Nnoaham et al., 2010; Centers for Disease Control and Prevention, 2011; Major et al., 2013; Suh et al., 2013; Wong et al., 2013). For example, in Singapore a co-payment program using stool and endoscopic tests, the uptake was 26.7% (Wong et al., 2013). In the UK a NHS program, using fecal occult blood test had 57.3% uptake (Nnoaham et al., 2010). The publicly-funded programs in Canada using stool tests, uptake was 16.1% (Major et al., 2013). One study in Malaysia reported extremely low screening rate (0.7%) within past five years ( Yusoff et al., 2012). We might therefore expect the introduction of similar screening programs in Thailand to face the same problem of low uptake.

Since individuals with a positive FIT are referred for colonoscopy, adherence to follow-up colonoscopy is as important as the initial uptake. Relative to the initial uptake, adherence rates to follow-up colonoscopy are relatively high - varying from 38.6% in Korea to 93.0% in Italy (Choi et al., 2012; Parente et al., 2013). Given its key role in the screening pathway, adherence to follow-up colonoscopy should be considered in addition to an initial uptake rate.

We conducted this study to determine preferences and acceptances of FIT and colonoscopy. This knowledge provides clues to an uptake rate of the screening program. Factors influencing acceptance of each test were identified along with reasons for accepting and rejecting it. Finally, the number of patients with advanced adenoma and CRC diagnosed during the first round of screening were estimated, shedding light on future incidence and mortality reduction and burden of screening to the health care system. Our results can facilitate health care planners to maximize performance of the screening program.

Materials and Methods

This study was conducted at Songklanagarind Hospital, a medical-school hospital operated by Prince of Songkla University, Songkhla Province. The Ethics Committee of the institute reviewed and approved the study protocol. The eligible subjects were patients aged 50-69 years, visiting the primary care clinic during June-August 2013. We excluded patients with a history of any cancer or past CRC screening. All patients visited the clinic during the study period were approached and assessed for their eligibility. If they satisfied our eligibility criteria, the interviewer explained the study rationale and objectives and requested their written consent.

Uptake rates varied widely between countries and previous literature on uptake of CRC screening in Thailand was not available (at the time this study was conducted). Therefore, the sample size was calculated to estimate an uptake rate of 50%; at this level of uptake, the sample size was largest given other parameters fixed. This mitigated the concern over insufficient sample size. The margin of error was set at 5%. The significance level was 0.05. After offsetting 10% of possibly incomplete data, the required sample size was 428.

A face-to-face interview followed a structured questionnaire that collected data on demographic characteristics, socio-economic status, health insurance coverage, current health status, medical history, family history, perceived risk of developing CRC, and risk attitudes toward health gains and losses (Breyer and Fuchs, 1982). Then, interviewers informed subjects about incidence rates, risk of CRC in Thai population, its treatments and survival rates of CRC patients.

Afterwards, interviewers provided information about CRC and screening tests to subjects by reading out the information sheets verbatim. The contents included general knowledge about CRC, risk of developing CRC in Thai population and information regarding both screening tests - FIT and colonoscopy. Information about screening tests consisted of process, complications, sensitivity, false positive rate and potential reduction in incidence and mortality rates. The pictures of instruments used in each test were presented to subjects along with related information. The screening frequencies were once a year for FIT and once in 10 years for colonoscopy. After all information was read out to subjects, the key messages summarized in a single poster were presented to subjects.
This enabled subjects to review all relevant information before answering subsequent questions.

Each subject was asked if they would be willing to participate in the CRC screening program without user fees. If they answered “no”, the interviewer would ask reasons behind their unwillingness. If they answered “yes”, the interviewer would ask them to choose their preferred screening test and explore reasons for their preference. Finally, the interviewer asked whether the subject was willing to screen with the other test if the test they had chosen was unavailable. If they rejected the alternative, their reasons would be explored.

All data analyses were performed using “epicalc” package on R version 3.0.2 (Chongsuvivatwong, 2012; R Core Team, 2013). Acceptance rates of screening, acceptance rates by selected factors and screening preferences were reported. Chi-squared and Fisher’s exact test were used to test for statistical significance in the

Table 1. Characteristics of Study Subjects and Acceptance Rates of FIT and Colonoscopy Stratified by Each Characteristic

| Characteristic          | Frequency (%) | FIT Acceptance rate (%) | P-value (χ²) | Colonoscopy Acceptance rate (%) | P-value (χ²) |
|-------------------------|---------------|-------------------------|--------------|---------------------------------|--------------|
| Overall                 | 437 (100.0)   | 74.1                    | -            | 55.6                            | -            |
| Gender                  |               |                         |              |                                 |              |
| Male                    | 183 (41.9)    | 74.9                    | 0.086        | 60.7                            | 0.09         |
| Female                  | 254 (58.1)    | 73.6                    |              | 52                              |              |
| Age (years)             |               |                         |              |                                 |              |
| 50-54                   | 119 (27.2)    | 70.6                    | 0.23         | 55.5                            | 0.22         |
| 55-59                   | 138 (31.6)    | 79.7                    |              | 62.3                            |              |
| 60-64                   | 111 (25.4)    | 74.8                    |              | 50.5                            |              |
| 65-69                   | 69 (15.8)     | 68.1                    |              | 50.7                            |              |
| Health insurance scheme |               |                         |              |                                 |              |
| UCS                     | 100 (22.9)    | 76                      | 0.19*        | 57                              | 0.38*        |
| SSS                     | 35 (8.0)      | 85.7                    |              | 65.7                            |              |
| CSMBS                   | 297 (68.0)    | 71.7                    |              | 53.9                            |              |
| Education level         |               |                         |              |                                 |              |
| Grade 6 or below        | 116 (26.5)    | 75.9                    | 0.38         | 50                              | 0.54         |
| Grade 7 - Grade 12      | 120 (27.5)    | 78.3                    |              | 56.7                            |              |
| Bachelor’s degree       | 143 (32.7)    | 72                      |              | 58.7                            |              |
| > Bachelor’s degree     | 58 (13.3)     | 67.2                    |              | 56.9                            |              |
| Marital status          |               |                         |              |                                 |              |
| Married                 | 363 (83.1)    | 74.9                    | 0.75*        | 57.3                            | 0.30*        |
| Single                  | 19 (4.3)      | 68.4                    |              | 36.8                            |              |
| Separated               | 15 (3.4)      | 66.7                    |              | 53.3                            |              |
| Widowed                 | 40 (9.2)      | 72.5                    |              | 50                              |              |
| Employment status       |               |                         |              |                                 |              |
| Employee                | 151 (34.6)    | 72.2                    | 0.38         | 56.3                            | 0.71         |
| Business owner          | 120 (27.5)    | 80                      |              | 59.2                            |              |
| Retired                 | 106 (14.3)    | 70.8                    |              | 51.9                            |              |
| Home-maker              | 60 (13.7)     | 73.3                    |              | 53.3                            |              |
| Household income per month (THB) |         |                         |              |                                 |              |
| 0-30 000                | 167 (38.2)    | 74.3                    | 0.61         | 52.7                            | 0.09         |
| 30 001-60 000           | 125 (28.6)    | 78.4                    |              | 53.6                            |              |
| > 60 000                | 127 (29.1)    | 73.2                    |              | 64.6                            |              |
| Perceived susceptibility to CRC |       |                         |              |                                 |              |
| Low                     | 289 (76.9)    | 71.6                    | 0.27*        | 51.9                            | 0.05         |
| Average                 | 67 (17.8)     | 79.1                    |              | 65.7                            |              |
| High                    | 20 (5.3)      | 85                      |              | 70                              |              |
| Knowing someone with CRC|               |                         |              |                                 |              |
| No                      | 338 (77.3)    | 71.6                    | 0.03*        | 54.4                            | 0.43         |
| Yes                     | 99 (22.7)     | 82.8                    |              | 59.6                            |              |
| Family history of cancer (any types) |       |                         |              |                                 |              |
| No                      | 314 (71.9)    | 77.2                    | 0.42         | 58                              | 0.14         |
| Yes                     | 123 (28.1)    | 72.9                    |              | 49.6                            |              |
| Company present during hospital visits |       |                         |              |                                 |              |
| No                      | 249 (57)      | 71.1                    | 0.12         | 53                              | 0.25         |
| Yes                     | 188 (43)      | 78.2                    |              | 59                              |              |
| Purchasing private health insurance |       |                         |              |                                 |              |
| No                      | 334 (76.4)    | 72.5                    | 0.19         | 52.4                            | 0.02*        |
| Yes                     | 103 (23.6)    | 79.6                    |              | 66                              |              |

FIT=fecal immunochemical test; UCS=Universal Coverage Scheme; CSMBS=Civil Servant Medical Benefit Scheme; SSS=Social Security Scheme; THB=Thai baht; CRC=colorectal cancer; *Fisher’s exact p-value; * p<0.05
bivariate analysis. Factors influencing acceptance were identified using logistic regression. The final model was selected according to its Akaike Information Criterion value.

As mentioned earlier about the proposed CRC screening program in Thailand, we finally estimated the potential number of individuals with positive FIT, advanced adenoma and CRC identified in the first round of screening. We anticipated that the target group for screening is Thai citizens aged 50-69. By assuming that subjects who accepted the test will utilize it when the screening program is carried out, age-and gender-adjusted acceptance rates for FIT and colonoscopy were employed as uptake rates of the program. To complete the calculation, we obtained population data from the NHSO database (National Health Security Office, 2014) and screening performances from the pilot screening conducted in North Thailand (Khuhaprema et al., 2014).

**Results**

A total 504 eligible individuals were approached by interviewers; 437 provided their written consents (response rate 86.7%). Figure 1 demonstrates overall acceptance of the screening program and screening method preference. Four-fifths of subjects showed their interest in the CRC screening program. They preferred FIT over colonoscopy as a screening test. Small portion of subjects expressed indifferent preferences for both tests. FIT was also widely accepted among subjects who preferred colonoscopy. In contrast, less than half of those who preferred FIT accepted colonoscopy.

In total, the acceptance rate was 74.1% for FIT and 55.6% for colonoscopy. Table 1 shows characteristics of study subjects and acceptance rates of each test stratified by each characteristic. Nearly 60% of subjects were female. The median age was 58 years. As indicated by chi-squared test, subjects who know someone with CRC had higher chance to accept FIT. Those purchased private health insurance were more likely to accept colonoscopy.

The results of logistic regression models were shown in Table 2. Subjects from the highest education group were less likely to accept FIT; although, overall effects of education was insignificant. Perceived susceptibility

### Table 2. Factors Influencing Acceptance of FIT and Colonoscopy

| Variable                              | FIT        | Coloscopy   |
|---------------------------------------|------------|-------------|
|                                       | OR 95% CI  | P-value     | OR 95% CI  | P-value     |
|                                       | Wald LR    | LR          | Wald LR    | LR          |
| Gender                                |            |             |            |             |
| Male                                  | 4.39 0.21  |             | 0.21       |
| Female                                | 0.81 0.48-1.38 0.44 0.74 0.46-1.18 0.21 |
| Age group (years)                     |            |             |            |             |
| 50-54                                 | 0.31       | 0.31        |
| 55-59                                 | 1.87 0.96-3.66 0.07 1.76 0.98-3.16 0.06 |
| 60-64                                 | 1.39 0.71-2.73 0.34 1.33 0.72-2.48 0.36 |
| 65-69                                 | 1.2 0.55-2.64 0.65 1.29 0.62-2.66 0.49 |
| Household income per month (THB)      |            |             |            |             |
| 0-30 000                              | 0.42 0.62  |
| 30 001-60 000                         | 1.54 0.77-3.08 0.22 0.94 0.52-1.73 0.85 |
| > 60 000                              | 1.13 0.53-2.42 0.74 1.27 0.64-2.51 0.5  |
| Education level                       |            |             |            |             |
| Grade 6 or below                      | 0.25 0.57  |
| Grade 7 - Grade 12                    | 0.64 0.30-1.39 0.26 0.88 0.45-1.71 |
| Bachelor’s degree                     | 0.53 0.23-1.24 0.15 1.33 0.64-2.76 |
| > Bachelor’s degree                   | 0.36 0.13-0.97 0.04* 0.95 0.39-2.34 |
| Health insurance scheme               | 0.32 0.08  |
| UCS                                   | reference  |
| SSS                                   | 1.81 0.50-6.57 0.37 1.24 0.45-3.44 0.68 |
| CSMBs                                 | 0.8 0.38-1.68 0.55 0.56 0.29-1.08 0.09 |
| Perceived susceptibility to CRC       | 0.34 0.04*  |
| Low                                   | reference  |
| Average                               | 1.25 0.64-2.45 0.51 1.72 0.95-3.09 0.07 |
| High                                  | 2.41 0.63-9.19 0.2 2.69 0.95-7.65 0.06 |
| Purchasing private health insurance   | 0.06 0.08  |
| No                                    | reference  |
| Yes                                   | 1.84 0.97-3.51 0.06 1.63 0.95-2.80 0.08 |
| Knowing someone with CRC              | 0.07       |
| No                                    | reference  |
| Yes                                   | 1.76 0.94-3.27 0.08 NS |
| Family history of cancer (any types)  |            |             |            |             |
| No                                    | reference  |
| Yes                                   | 0.53 0.32-0.87 0.01* |

FIT=fecal immunochemical test; OR=odds ratio; 95% CI = 95% confidence interval; Wald=Wald test; LR= likelihood ratio test; THB=Thai baht; UCS=Universal Coverage Scheme; SSS=Social Security Scheme; CSMBs=Civil Servant Medical Benefit Scheme; CRC = colorectal cancer; NS=not statistically significant; *p<0.05
Table 3. Reasons for Choosing and Rejecting FIT and Colonoscopy

| Reason for choosing       | Frequency (%) |
|--------------------------|---------------|
| FIT                      |               |
| Anxious about colonoscopy process | 43 (23.2) |
| FIT is convenient         | 42 (22.7)    |
| No pain                  | 34 (18.4)    |
| Colonoscopy              |               |
| Colonoscopy is accurate  | 91 (59.9)    |
| Less frequent screening  | 33 (21.7)    |
| Providing quicker definitive diagnosis | 22 (14.5) |

| Reason for rejecting       | Frequency (%) |
|---------------------------|---------------|
| FIT                       |               |
| Only want to screen with colonoscopy | 15 (62.5) |
| FIT is inconvenient        | 2 (8.2)      |
| Too frequent screening     | 2 (8.2)      |
| Colonoscopy               |               |
| Anxious about colonoscopy process | 44 (41.9) |
| Initial screening should be FIT | 10 (9.5) |
| Too complicated process   | 8 (7.6)      |

FIT = fecal immunochemical test; *OF 185 subjects who preferred FIT; †OF 24 subjects who were not willing to screen with FIT; ‡OF 152 subjects who preferred colonoscopy; §OF 105 subjects who were not willing to screen with colonoscopy

Table 4. Estimated Number of Thais with a Positive FIT, Advanced Adenoma and CRC Identified in the First Round of the Screening Program

| Population                                      | Number (persons) |
|------------------------------------------------|------------------|
| Target population (aged 50-69)                  | 13 294 791       |
| Participating in the screening program (adjusted by age and gender) | 9 764 674       |
| Positive FIT                                    | 106 546          |
| 100% adherence to follow-up colonoscopy         |                  |
| Advanced adenoma                                | 12 749           |
| CRC                                             | 3912             |
| 67.6% adherence to follow-up colonoscopy        |                  |
| Advanced adenoma                                | 8618             |
| CRC                                             | 2645             |

FIT=fecal immunochemical test; CRC=colonoscopy

Figure 1. Screen Test Preference and Acceptance.

|                 | Yes    | No    | Total |
|-----------------|--------|-------|-------|
| Participate in the screening program? |        |       |       |
| Yes             | 348    |       | 348   |
| (79.6%)         |        |       |       |
| No              | 89     |       | 89    |
| (20.4%)         |        |       |       |

| Preferred screening test | FIT | Either | COL | Total |
|--------------------------|-----|--------|-----|-------|
|                         | 185 | 11     | 152 | 248   |
| (42.3%)                 | (2.5%)| (34.8%)|      |       |

| Accept COL | Yes | No |
|------------|-----|----|
|             | 80  | 105|
| (43.2%*)   | (56.8%*)|      |

| Accept FIT | Yes | No |
|-----------|-----|----|
|            | 128 | 24 |
| (84.2%**)  | (15.8%**)|     |

Discussion

Among study subjects, FIT was preferred over colonoscopy. Perceived susceptibility to CRC and family history of cancer were associated with the acceptance of colonoscopy. Misunderstandings of the screening purposes led to lack of interest in screening.FIT was preferred for its simplicity and non-invasiveness compared with colonoscopy. However, those with strong preference for colonoscopy rejected screening with FIT. Colonoscopy was preferred for its accuracy and rejected for its process and complications. The first round of the screening program potentially identifies over 100,000 positive FIT cases. Thousands of those would end up with advanced adenoma and CRC.

FIT outperformed colonoscopy regarding subjects’
preferences. Other studies reported similar outcomes. Randomized controlled trials (RCTs) conducted in Spain and US reported higher uptake rates in the FIT arm compared with the colonoscopy arm (34% versus 25% in a Spanish study, 41% versus 25% in a US study) (Quintero et al., 2012; Gupta et al., 2013). In a Hong Kong study, which allowed subjects to choose between FIT and colonoscopy, the majority (61%) picked FIT after being informed about both tests (Wong et al., 2012). The high acceptance of FIT supports its use as the primary screening tool at the population level.

In this study, we implicitly treated the acceptance rates of screening tests as potential uptake and adherence of the proposed screening program. This should be carefully interpreted since our subjects did not represent general population. Rather, they were ones who had already accessed to care. Hence, the inference of the uptake rate from the acceptance rate is likely to provide an optimistic estimate. Previous studies supported this argument. They found the discrepancies between subjects’ responses and their actual screening behaviors: the uptake rates estimated in the studies tended to be higher than the actual ones (Carson et al., 1996; Marshall et al., 2010). For the adherence to colonoscopy, our estimate was 67.6%, whereas previous studies reported relatively high colonoscopy adherence among positive FIT cases: 87% in Spanish study, 92% in Italian study, 96% in Netherlands study and 79% in UK study (Hol et al., 2010; Moss et al., 2012; Quintero et al., 2012; Parente et al., 2013).

The high acceptance of FIT provides the prospect for the proposed screening program in achieving the WHO recommended uptake of 70% (Miller, 2007). However, actual uptake rates of screening with FIT in many countries did not reach this goal: Spain 34.2%, Italy 49.7%, Netherlands 61.5%, UK 61.8% and Australia 45.4% (Bowel Cancer Screening Pilot Monitoring and Evaluation Steering Committee, 2005; Hol et al., 2010; Moss et al., 2012; Quintero et al., 2012; Parente et al., 2013). Hence, we might regard the acceptance rate of FIT (74.1%) as an upper bound of the actual uptake rate.

The acceptance of colonoscopy increased with perceived susceptibility. This association existed in other studies as well (Honda, 2004; Sun et al., 2004). As perceived susceptibility had no effects on FIT acceptance, FIT could attract wider range of population, regardless of their perceived susceptibility, at the initial screening step. This somewhat justifies the use of FIT as a primary screening tool. As effects of knowing someone with CRC was simultaneously adjusted for in the regression model, the variable - family history of cancer - indeed indicates subjects’ familiarities with cancers other than CRC. Since effective screening is merely available for few types of cancer, familiarities with less preventable cancers might lead to lower likelihood of accepting colonoscopy.

Those unwilling to screen revealed their misunderstandings of the screening concepts. The similar misunderstandings were demonstrated in other studies (Hilmi et al., 2010; Suh et al., 2013). Hence, there is an opportunity to heighten acceptance of the screening program by correcting those misunderstandings. The recent study reported higher uptake rates in individuals who were informed about the screening (Hong and Kam, 2014). Those rejecting FIT revealed strong preference for colonoscopy. Health authorities might consider adding colonoscopy as an alternative primary screening tool. However, this complicates the screening logistics with small increase in overall acceptance of the program (5.5%). Those rejecting colonoscopy cited its process and complications. The emphasis on very rare occurrence of severe complications (0.01-0.3% for bowel perforation) (Waye et al., 1992; Misra et al., 2004; Quintero et al., 2012) may relieve their concerns. The other explanations for refusing to screen reported in present study were in common with previous studies (Yusoff et al., 2012; Tastan et al., 2013; Norwati et al., 2014).

From our crude estimation, the first round of screening potentially detects over 100 000 cases with a positive FIT. Over 8000 to 13 000 cases with advanced adenoma and between 2600 to 4000 cases with CRC will be diagnosed, whereas a number of new CRC cases in 2006 were 7000 (National Cancer Institute, 2012). As discussed earlier, uptake rates reported in this study might be overestimated; these potential numbers of positive FIT, adenoma and CRC cases should be interpreted as optimistic estimates or upper bounds of actual figures as well. The removal of advanced adenoma lowers the cancer incidence. The screening detects less advanced cancer (Cole et al., 2013), for which treatments can lower the mortality. However, the figures implied additional workloads to endoscopists, surgeons and others related health care workers as well as health care facilities. Health care planners should vigorously plan for health care system capacities to handle the burden of screening.

Our results support the use of FIT in the Thailand CRC screening program as it was widely accepted. In addition, FIT does not require specially-trained personnel and can be adopted at the sub-district health care centers as demonstrated in the pilot screening study (Khuhaprema et al., 2014). Informing public about the screening program will potentially raise its acceptance and uptake. Nevertheless, health care system should be prepared for increasing burden from the screening program. Further research should be conducted in different settings (e.g., provincial hospitals, community hospitals and health care centers) as well as in other regions of Thailand. Health authorities can exploit this information and properly design the screening program.

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