

Colorectal cancer screening by fecal immunochemical test or colonoscopy in France: how many people are actually covered? Focus on the Provence-Alpes-Côte d'Azur region

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Background Colorectal cancer (CRC) screening with fecal immunochemical test (FIT) remains low in France, particularly in the Provence-Alpes-Côte-d'Azur (PACA) region. The aim of this study was to compare insured persons (50–74 years) who had FIT and/or colonoscopy in PACA with the general French population.

Methods FIT and colonoscopy rates were calculated according to SP-France and National Health Data System data.

Results The rate of FIT in 2016–2017 was lower in PACA than in France (25.6 vs. 29.1%, $P < 0.001$). Conversely, in 2013–2017, the rate of colonoscopy in the past 5 years was higher in PACA than in France (23.1 vs. 20.1%, $P < 0.001$). Total rate for FIT within 2 years and/or colonoscopy within 5 years was 46.0% in PACA vs. 46.5% in France ($P < 0.001$). Overuse was higher for diagnostic (1.21) than therapeutic colonoscopies (1.05). Therapeutic colonoscopy occurred more with FIT than without (47.88 vs. 38.7%, $P < 0.001$). According to USA criteria, persons with FIT within 2 years and/or sigmoidoscopy and/or colonoscopy within 10 years was 59.4% in PACA vs. 54.7% in France ($P < 0.001$).

Conclusion Low participation in FIT in France must be improved to increase the rate of therapeutic colonoscopies and reduce the incidence of CRC. The higher colonoscopy rate in PACA could explain the lower CRC mortality. Efforts should be focused on the more than 40% of French insured who are not screened by either FIT or colonoscopy. *Eur J Gastroenterol Hepatol* 34: 405–410

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Introduction

In 2021, colorectal cancer (CRC) remains a major public health problem worldwide (1850 million new cases and 880 000 deaths per year) [1]. France has a high incidence: CRC represents the third most common cancer (43 336 new cases in 2018) and the second cause of cancer mortality, with more than 17 000 deaths [2].

Screening programs reduce the mortality of CRC, through early detection and treatment of cancer [3] but also its incidence, through the detection and removal of precancerous lesions, the advanced adenomas [4,5]. Early

studies showing a reduction in CRC mortality were based on fecal occult blood tests and subsequent colonoscopy, and used a biochemical guaiac test [3,6–8]. The introduction of fecal immunochemical tests (FITs), which are superior to guaiac tests for the detection of advanced adenomas [9,10], has also reduced the incidence of CRC [4,5]. Thus, CRC screening is recommended from the age of 50 years in average-risk patients by the Council of Europe [11], the Asia-Pacific group [12], and the American societies, grouped in the 'U.S. Multisociety Task Force' [13].

In the USA, the screening method is left to the patient's preference and the availability of tests: annual fecal occult blood test or tumor DNA test (every 3 years), flexible sigmoidoscopy (FS) (every 5 years), and colonoscopy (every 10 years) [14]. The efficacy of sigmoidoscopy has been provided by several randomized studies [15–18], and that of colonoscopy comes indirectly from randomized trials of sigmoidoscopy, as well as from case-control studies [19,20]. FIT (annually or every 2 years) and total colonoscopy (every 10 years) are the most commonly used screening tests worldwide [21]. The American societies set a goal of having this 'multimodal' screening applied to more than 80% of the insured by 2018 [22]. This goal has been achieved in some states with an impressive reduction in CRC incidence and mortality [21].

In France, the national CRC-screening program, which was extended to its entire population in 2008, is adapted to the individual risk level of the insured. It proposes a fecal occult blood test (hemocult until 2014, then FIT

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from May 2015) every 2 years for insured persons at average risk, men and women aged 50–74 years, and a colonoscopy for subjects at high risk (family history or personal history of cancer or those with a chronic inflammatory disease), or very high risk (familial adenomatous polyposis or hereditary nonpolyposis CRC or hereditary nonpolyposis colorectal cancer).

FIT has a higher participation rate than guaiac testing [9,10] and colonoscopy in randomized trials [23]. It has a comparable cancer detection rate to colonoscopy and a lower detection rate for advanced adenomas in a recent meta-analysis, but it is more cost-effective [23,24].

Despite the efficacy of FIT at the thresholds used in France (30 µg hemoglobin per gram of feces), that is, screening 2.4 times more cancers and 3.7 times more advanced adenomas [25], and despite its simplicity of use, the participation rate remains low (33.5% for 2016–2017) [26]. This is much lower than the European recommendations (45% minimum acceptable, 65% recommended) and than results in some countries such as Italy (47%) [27] and the Netherlands (71%) [28]. However, over the same period, the medical exclusion rate (subjects at high or very high risk, and subjects who have had colonoscopy within 5 years) was 12.9%. This exclusion rate (declarative) varied greatly from one region to another (from 4.3 to 16.2%) [26]. The French regional screening coordination centers do not know the exact percentage of insured persons who had a colonoscopy within 5 years.

The Provence-Alpes-Côte-d'Azur (PACA) region has a population of 5 million (about 7.5% of the French population). There the incidence of CRC is close to the national average. Mortality, however, is one of the lowest with a standardized mortality ratio of 0.86 (0.84–0.88) in men and 0.91 (0.88–0.93) in women [29]; yet the participation rate in FIT screening is lower than the national one (28 vs. 33.5% for 2016–2017) [26].

The aim of this work was to evaluate the percentage of insured persons aged 50–74 years who received CRC screening by FIT and/or colonoscopy in the PACA region, to look for variations between *départements*, to assess the rate of therapeutic colonoscopies, and to compare these results with those of the whole of France.

Materials and methods

The FIT utilization rate was defined as the crude percentage of insured persons in the INSEE target population (age range 50–74 years) who had a test, between 2016 and 2017 (within 2 years), without taking into account medical exclusions. Data were obtained from Santé Publique France [26]. The FIT used was the OC-Sensor test, with an automated, centralized reading (Cerba), with a cutoff level of greater than 30 µg hemoglobin per gram of stool for a positive result.

For colonoscopy, the utilization rate was the crude percentage of insured persons in the INSEE target population (age group 50–74 years) who had a colonoscopy between 2013 and 2017 (within 5 years). The data come from the National Health Data System.

The data for colonoscopies were the 2013–2017 Programme de médicalisation des systèmes d'information (PMSI) data [30]: stay including at least one procedure from

the CCAM list of diagnostic ('HHQE002', 'HHQE003', 'HHQE004', 'HHQE005', and 'HJQE001') or therapeutic colonoscopy procedures ('HHFE001', 'HHFE002', 'HHFE004', 'HHFE005', 'HHFE006', 'HHNE001', 'HHNE002', 'HHNE003', and 'HHNE004'). The list of procedures is given in Appendix A.

For insured persons who had FIT and colonoscopy, it is considered that for most of them, the colonoscopy was induced by a positive FIT result: they are counted in the FIT group.

Associations between categorical variables were measured by the χ^2 test (Pearson's chi-squared test).

Results

In the PACA region, 402 074 insured persons among the 1 570 252 INSEE target population had FIT in 2016–2017. This FIT rate of 25.6% differs from the standardized INSEE participation rate (28%) because it does not take into account the standardized medical exclusion rate (8.8%). Within PACA, it varied from one *département* to another, from 21.1% in the Alpes-Maritimes to 29.7% in the Hautes-Alpes (Table 1). The FIT rate in France as a whole was 29.1%, with a standardized participation rate of 33.5% and an exclusion rate of 12.9%. The rate in PACA was significantly lower than in France as a whole (25.6 vs. 29.1%, $P < 0.001$) (index: 0.88). This underuse of FIT varied significantly from one *département* to another ($P < 0.001$), marked in the Alpes-Maritimes (0.72), but absent in the Hautes-Alpes (1.02).

Conversely, in PACA, there was an over-referral to colonoscopy: in 2013–2017, 23.1% of insured persons in the target population aged 50–74 years had a complete colonoscopy within 5 years – this standardized referral rate corresponds to an over-referral of 1.16 compared with France as a whole, where only 20.1% had a colonoscopy in the target population ($P < 0.001$). The rate of complete colonoscopy in PACA varied significantly from one *département* to another, from 18.1% in the Alpes-de-Haute-Provence to 25.4% in the Alpes-Maritimes ($P < 0.001$), which corresponds to a slight under-recourse (0.90) in the Alpes-de-Haute-Provence and a marked over-recourse (1.26) in the Alpes-Maritimes.

For all colonoscopies (complete or partial) in 2013–2017 (Table 2), the rate of insured persons having had multiple colonoscopies was 13.4% in PACA vs. 12.1% in France as a whole ($P < 0.001$), which corresponds to an over-recourse to multiple colonoscopies of 1.11. These are either combinations of complete colonoscopy–complete colonoscopy (10.4% in PACA vs. 9.2% in the whole of France, $P < 0.001$), or combinations of complete colonoscopy–partial colonoscopy (2.7 vs. 2.7%), or combinations of partial colonoscopy–partial colonoscopy (0.23 vs. 0.22%).

The rate of insured persons aged 50–74 having had FIT within 2 years and/or colonoscopy within 5 years was 46.0% in PACA vs. 46.5% in France as a whole ($P < 0.001$). It varied significantly from one *département* to another within the region, from 41.5% in the Alpes-de-Haute-Provence to 50.8% in the Haute-Alpes ($P < 0.001$). It should be noted that 42 738 insured persons in PACA (i.e. 2.7% of the target population) had FIT and colonoscopy; it was assumed that this rate was the same (2.7%) in France as a whole.

Table 1. Rate of insured 50–74-year olds who had fecal immunochemical test within 2 years (2016–2017) and/or colonoscopy within 5 years (2013–2017)

| Area | Population ^a | FIT (2016–2017) | | | | Colonoscopy (2013–2017) | | | Total FIT and/or colonoscopy | | FIT + colonoscopy | |
|-------------------|-------------------------|-----------------|-------------------|-------------------|-------|-------------------------|------|-------|------------------------------|------|----------------------|-----|
| | | N | % ^c | SIPR ^d | Index | N | % | Index | N | % | N | % |
| France | 19 373 949 | 5 646 116 | 29.1 ^c | 33.5 | 1 | 3 894 215 | 20.1 | 1 | 9 017 236 | 46.5 | 523 095 ^f | 2.7 |
| PACA ^b | 1 570 252 | 402 074 | 25.6 | 28.0 | 0.88 | 363 263 ^e | 23.1 | 1.16 | 722 618 | 46.0 | 42 738 | 2.7 |
| 04 | 59 212 | 15 425 | 26.0 | 29.0 | 0.89 | 10 707 | 18.1 | 0.90 | 24 579 | 41.5 | 1542 | 2.7 |
| 05 | 47 136 | 14 002 | 29.7 | 35.8 | 1.02 | 11 254 | 23.9 | 1.19 | 23 946 | 50.8 | 1323 | 2.8 |
| 06 | 348 108 | 73 359 | 21.1 | 24.5 | 0.72 | 88 419 | 25.4 | 1.26 | 153 780 | 44.2 | 7965 | 2.4 |
| 13 | 583 792 | 161 715 | 27.7 | 28.1 | 0.95 | 134 494 | 23.0 | 1.14 | 278 490 | 47.7 | 17 602 | 3.0 |
| 83 | 356 251 | 91 065 | 25.6 | 28.9 | 0.88 | 84 891 | 23.8 | 1.18 | 166 274 | 46.7 | 9878 | 2.7 |
| 84 | 175 753 | 46 508 | 26.5 | 29.7 | 0.91 | 33 940 | 19.3 | 0.96 | 75 519 | 43.0 | 4471 | 2.5 |

FIT, fecal immunochemical test; INSEE, Institut national de la statistique et des études économiques; PACA, Provence-Alpes-Côte-d'Azur.

^aTarget population according to INSEE (2016–2017).

^bPACA region is composed of six French *départements* – 04: Alpes-de-Haute-Provence, 05: Hautes-Alpes, 06: Alpes-Maritimes, 13: Bouches-du-Rhône, 83: Var, 84: Vaucluse.

^cThis coverage rate (29.1%) is lower than the standardized INSEE participation rate (33.5%) because it does not take into account the exclusion rate.

^dSIPR: standardized INSEE participation rate – takes into account the standardized medical exclusion rate.

^eThe total number of procedures in the PACA region (363 263) is slightly lower than the sum of the *départements* (363 705), as some insured persons may have several postal codes (moving, etc.).

^fA total of 523 095 procedures represents 2.7% of the national target population: the rate of insured persons with FIT + colonoscopy was considered to be the same in France as in the PACA region, that is, 2.7 %.

Table 2. Rate of insured 50–74-year olds who had fecal immunochemical test within 2 years (2016–2017) and/or colonoscopy within 10 years (2008–2007) and/or flexible sigmoidoscopy within 5 years (2013–2017)

| | Population ^a | FIT/2 years | | | Colonoscopy/10 years | | | Sigmoidoscopy/5 years | | | Total | | |
|--------|-------------------------|-------------|------|-------|----------------------|-------------------|-------|-----------------------|-----|-------|------------|---------------------|-------|
| | | (2016–2017) | | | (2008–2017) | | | (2013–2017) | | | | | |
| | | N | % | Index | N | % | Index | N | % | Index | N | % | Index |
| France | 19 373 949 | 5 646 116 | 29.1 | 1 | 5 353 552 | 27.6 | 1 | 117 827 | 0.7 | 1 | 10 594 400 | 54.7 ^b | 1 |
| PACA | 1 570 252 | 402 074 | 25.6 | 0.88 | 564 107 | 35.9 ^c | 1.30 | 10 323 | 0.6 | 0.85 | 933 785 | 59.4 ^{b,c} | 1.09 |

FIT, fecal immunochemical test; INSEE, Institut national de la statistique et des études économiques; PACA, Provence-Alpes-Côte-d'Azur.

^aTarget population according to INSEE (2016–2017).

^bA total of 2.7 % of insured persons had FIT + colonoscopy.

^c $P < 0.001$.

We looked also at insured persons who had a colonoscopy within 10 years: over the period 2008–2017, 35.9% of insured persons among the target population aged 50–74 years in the PACA region had a complete colonoscopy – this standardized recourse rate corresponds to an over-referral of 1.30 compared with all of France, where only 27.6% of insured persons in the target population had a colonoscopy (35.9 vs. 27.6%; $P < 0.001$). The rate of colonoscopy within 10 years also varied from one *département* to another, from 29.6% in the Alpes-de-Haute-Provence to 40.7% in the Alpes-Maritimes (over-referral of 1.07–1.48). The rate of insured persons aged 50–74 years having had FIT within 2 years and/or a colonoscopy within 10 years was 58.8% in PACA vs. 53.9% in the whole of France ($P < 0.001$). Finally, 0.6% of PACA insured had an FS, not associated with a complete colonoscopy, within 5 years between 2013 and 2017 vs. 0.7% in the whole of France. Thus, the rate of insured persons up to date with their screening according to the USA criteria (annual or biennial FIT, sigmoidoscopy within 5 years, and total colonoscopy within 10 years) was 59.4% in PACA and 54.7% in all of France ($P < 0.001$) (Table 2).

Finally, we studied the rate of therapeutic colonoscopy in PACA in 2016–2017 and the possible influence on this rate of performing FIT during the same period. Among the 168 439 complete colonoscopies in PACA among 50–74-year olds during these 2 years, 67 551 (40.1%)

were therapeutic colonoscopies. In France as a whole, the rate of therapeutic colonoscopies was 43.9% (798 675 among 1 820 584 complete colonoscopies). This overuse of colonoscopy among 50–74-year olds (index: 1.14) was mainly related to diagnostic colonoscopies (index: 1.21), with little influence on therapeutic colonoscopies (index: 1.05) (Table 3). Moreover, for 2016–2017, in PACA, there were more therapeutic colonoscopies when colonoscopy was preceded by FIT than when it was not combined with FIT (47.8 vs. 38.7%, $P < 0.001$).

Discussion

Our study shows that the percentage of French insured undergoing FIT within 2 years (2016–2017) or colonoscopy within 5 years (2013–2017) was 46.5%, with 29.1% of FITs and 20.1% of colonoscopies. This percentage is close but slightly lower in the PACA region (46%), where there is under-recourse to FIT (25.6%) offset by over-recourse to colonoscopy (23.1%). However, this over-recourse on colonoscopy in 2016–2017 (index: 1.14) was mainly on diagnostic colonoscopies (index: 1.21) and little on therapeutic colonoscopies (index: 1.05). Therefore, FIT participation should be increased to increase the rate of therapeutic colonoscopies, and thus decrease the incidence of CRC by increasing the rate of removal of advanced adenomas. We have shown that colonoscopies

Table 3. Rate of insured 50–74-year olds who had complete colonoscopy within 2 years (2016–2017), diagnostic or therapeutic, associated or not with fecal immunochemical test before colonoscopy

| | Population ^a | All colonoscopies | | | Diagnostic colonoscopies | | | Therapeutic colonoscopies | | |
|-------------------|-------------------------|-------------------|------|-------|--------------------------|-----|-------|---------------------------|-----|-------|
| | | N | % | Index | N | % | Index | N | % | Index |
| France | 19 373 949 | 1 820 584 | 9.4 | 1 | 1 021 909 | 5.3 | 1 | 798 675 | 4.1 | 1 |
| PACA ^b | 1 570 252 | 168 489 | 10.7 | 1.14 | 100 938 | 6.4 | 1.21 | 67 551 | 4.3 | 1.05 |
| 04 | 59 212 | 4885 | 8.2 | 0.87 | 2964 | 5.0 | 0.94 | 1921 | 3.2 | 0.78 |
| 05 | 47 136 | 4988 | 10.6 | 1.13 | 2991 | 6.3 | 1.19 | 1997 | 4.2 | 1.03 |
| 06 | 348 108 | 41 475 | 11.9 | 1.26 | 26 656 | 7.6 | 1.44 | 14 819 | 4.2 | 1.04 |
| 13 | 583 792 | 62 494 | 10.7 | 1.14 | 37 303 | 6.4 | 1.21 | 25 191 | 4.3 | 1.05 |
| 83 | 356 251 | 38 756 | 10.9 | 1.16 | 21 180 | 5.9 | 1.12 | 17 576 | 4.9 | 1.20 |
| 84 | 175 753 | 15 855 | 9.0 | 0.96 | 9821 | 5.6 | 1.05 | 6034 | 3.4 | 0.84 |

INSEE, Institut national de la statistique et des études économiques; PACA, Provence-Alpes-Côte-d'Azur.

^aTarget population according to INSEE (2016–2017).

^bPACA region is composed of six French *départements* – 04: Alpes-de-Haute-Provence, 05: Hautes-Alpes, 06: Alpes-Maritimes, 13: Bouches-du-Rhône, 83: Var, 84: Vaucluse.

associated with FIT are more often therapeutic (47.8 vs. 38.7%, $P < 0.001$). This confirms the well-known data: the adenoma detection rate (ADR) varies not only according to the age and sex of the patient, the geographical region, and the level of training of the endoscopist, but also according to the indication for the colonoscopy [31] – thus, Cubiella *et al.* [32] using data of the COLON PREV study showed that the median ADR is 31% for primary exploration colonoscopies and 55% for colonoscopies in the FIT-positive population. The minimum threshold of 20% for a screening colonoscopy would rise to 45% for an FIT-guided colonoscopy.

In the French healthcare system, an invitation is sent by mail to all insured persons in the target population. In fact, the regional cancer screening coordination centers do not have access to the colonoscopies performed on insured persons. In their invitation letter to undergo FIT, policyholders are encouraged to declare reasons for medical exclusion, such as a personal or family history of adenoma or cancer, which classifies them as high or very high risk for CRC, or if they have had a colonoscopy within 5 years. Clearly, the medical exclusion rate (12.9% over the period 2016–2017), which is declarative, is largely underestimated, because 20% of the French insured had had colonoscopy within 5 years. If we recalculate the standardized participation rate for the French FIT organized screening program, taking into account the rate of colonoscopy within 5 years, the participation rate in France is 36.5% (instead of 33.5%) and 33% (instead of 28%) in the PACA region.

This participation in FIT, however, is still far below the rates recommended by Europe (45% minimum acceptable, 65% recommended) [11] and the rates obtained in certain European countries such as Italy (47%) [27] and the Netherlands which peaks at 71% [28]. It seems essential that the French regional centers have access to the colonoscopy records of the insured not only to obtain more precise figures on participation in the organized screening campaign (by FIT and colonoscopy), but also to better target FIT invitations (some FITs are performed shortly after a colonoscopy and are therefore inappropriate or do not comply with the 'theoretical' organized screening strategy), and possibly to remind high-risk insured of the dates of follow-up colonoscopies.

A recent estimate shows that the French organized screening program, even with such a low participation rate (around 30%), remains cost-effective [24] and prevents

nearly 3000 deaths each year [33]. By doubling the participation rate, at least 4000 additional deaths would be avoided.

Finally, to compare the results in France with those from the USA, we assessed the rate of insured persons covered by FIT within 2 years, colonoscopy within 10 years, or FS within 5 years. It appears that 54.7% of such persons in France have benefited from 'multimodal' screening; this figure increases to 59.4% in PACA ($P < 0.001$). The over-reliance on colonoscopy within 10 years in PACA compared with France as a whole is striking (36 vs. 28%, i.e. index: 1.30). This could explain, at least in part, the lower CRC mortality in the region and the benefit of screening whether organized or individual [28]. Surprisingly, the percentage of insured persons living below the poverty line, which is a factor associated with higher CRC mortality [34], is higher in the PACA than in the rest of France. But this lower mortality could be due to the higher density of gastroenterologists and general and digestive surgeons in the region, facilitating access to care [35,36].

These results call for several comments: first, the number of flexible sigmoidoscopies was very low (0.7% of French insured persons in the 50–74 years group), which shows that this examination, even though it has proven effective in reducing CRC mortality in several randomized studies [15–18], has fallen in disuse in real life, to the benefit of complete colonoscopy. Second, one of the limitations of our work is that the figures for colonoscopies within 10 years are not reliable: they concern the period 2008–2017, and the PMSI in 2008 was in its infancy, with a risk of missing data. However, these figures for insured persons covered by colonoscopy within 10 years, if erroneous, could be slightly higher: we can, therefore, consider that at least 55% of the insured persons in France and at least 59% in the PACA region were covered by FIT or colonoscopy within 10 years or sigmoidoscopy within 5 years. These results remain far below the USA target (>80%) and the results for California published by the Kaiser Permanente Medical Center where 83% of the insured are screened, with 48% of annual FIT, 33% of colonoscopy within 10 years, and 1% of sigmoidoscopy within 5 years [21]. It should be noted that the rates of colonoscopy within 10 years are similar (28% in France, 36% in PACA, and 33% in California), as are the rates of sigmoidoscopy (0.7% in France vs. 1% in California). In contrast, the rate of FIT is much lower in France (29 vs.

48%), whereas FIT is annual in California (and in the USA recommendations) and biennial in France.

The major increase in participation in the Kaiser Permanente Medical Center program, from 40% in the early 2000s to over 80% in 2015, is largely related to the replacement of guaiac fecal occult blood test (gFOBT) by FIT in 2006. Whereas participation in the guaiac test was between 5 and 8%, participation in FIT rapidly increased to over 30% in 2008, and then over 40% in 2012. In France, the gFOBT participation rate was between 30 and 34% until 2014, but the introduction of FIT in 2015 had no effect on participation, which peaked at 33.5% in 2016–2017 to drop to 32% in 2017–2018 and then to 30.5% in 2018–2019. Because the distribution of the test relies on general practitioners [37], they may not have appreciated the far superior efficacy of the immunological test compared to the guaiac test. Another factor that may have played a negative role and prevented the expected increase in participation is that the test was not included when the second reminder was mailed; it was reinstated in 2018 [38]. Mailing the test with the first invitation, successfully conducted in some countries [21,28], increased test usage by 10–20% in randomized trials [39]. A large majority of the CRC-screening programs in the European Union have adopted this practice [40], which should soon be tested in France.

Regarding barriers to participation, in addition to the known barriers (sex, ethnicity, level of education, income, marital status, place of residence, etc.) [41,42], it seems that the main obstacle to participation in France is the difficulty for insured persons to obtain the test. Indeed, to get it, they have to consult their general practitioner. The French government plans in the new 10-year cancer strategy plan 2021–2030 [43] to implement new modalities of access to the test: online ordering by the insured, by the end of 2021 and distribution of the tests by pharmacists during 2022.

Efforts should be focused on the more than 40% of the French policyholders who are not screened by either FIT or colonoscopy, and who appear to be the most at risk of developing CRC [44].

Conclusion

Although less than one in three of the French insured persons in the target population in France and in the PACA region is screened by FIT in the national program, nearly half are screened by FIT within 2 years or colonoscopy within 5 years. With the USA criteria (FIT or colonoscopy within 10 years or sigmoidoscopy within 5 years), more than half of the insured are screened (56% in France and 59% in PACA). This screening participation, which is still far from the objective set in the USA (>80%), is higher than the European minimum acceptable FIT target rate (>45%). Over-reliance on colonoscopy within 10 years in the PACA region could explain, in part, the lower CRC mortality rate compared to other French regions. It appears, therefore, that it is necessary to take into account all screening, whether individual or collective, to better assess the rate of CRC screening in France.

The question that this study raises is that of the appropriate use of public funds and the relevance of diagnostic procedures. Taking into account colonoscopy procedures within 5 years of the insured persons in the targeting

strategy of the invitation to organized screening should increase the efficiency of the campaign and better target the geographical areas of neighborhoods with the lowest rates.

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Conflicts of interest

There are no conflicts of interest.

Appendix A: Procedures for diagnostic or therapeutic colonoscopies according to Classification Commune des Actes Médicaux (CCAM) from French health insurance

| Type | CCAM code | Wording |
|-------------|-----------|---|
| Therapeutic | HHFE001 | Removal of 1–3 polyps less than 1 cm in diameter from the colon and/or rectum, by rectosigmoidoscopy or partial colonoscopy |
| Therapeutic | HHFE002 | Removal of 1–3 polyps less than 1 cm in diameter from the colon and/or rectum, by total colonoscopy |
| Therapeutic | HHFE004 | Removal of a polyp of more than 1 cm in diameter or four or more polyps of the colon and/or rectum, by total colonoscopy |
| Therapeutic | HHFE005 | Removal of a polyp larger than 1 cm or four or more polyps of the colon and/or rectum, by rectosigmoidoscopy or partial colonoscopy |
| Therapeutic | HHFE006 | Rectocolic mucosectomy session, by endoscopy |
| Therapeutic | HHNE001 | Session of lesion destruction of the colon and/or rectum without laser, by total colonoscopy |
| Therapeutic | HHNE002 | Session of lesion destruction of the colon and/or rectum with laser, by total colonoscopy |
| Therapeutic | HHNE003 | Session of lesion destruction of the colon and/or rectum with laser, by rectosigmoidoscopy or partial colonoscopy |
| Therapeutic | HHNE004 | Session of lesion destruction of the colon and/or rectum without laser, by rectosigmoidoscopy or by partial colonoscopy |
| Diagnostic | HHQE002 | Total colonoscopy, with crossing of the ileo-colic orifice |
| Diagnostic | HHQE003 | Complete exploration of the colon after right colectomy, by endoscopy |
| Diagnostic | HHQE004 | Partial colonoscopy beyond the sigmoid colon |
| Diagnostic | HHQE005 | Total colonoscopy with visualization of the caecal basin, without crossing the ileocolic orifice |
| Diagnostic | HJQE001 | Flexible sigmoidoscopy |

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