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島根県在住高齢者の口腔不健康状態と 早期介護認定や死亡の発生との関連性

Effect of oral health on functional disability and mortality in older adults in Japan: A cohort study

島根県歯科医師会

今回の論文掲載の意義は？

- 世界的に評価された医学誌に掲載されました。
- 発表内容は、世界に発信され結果は今後エビデンスとして広まっていきます。
- お口の健康を維持向上させる事で(とくに、しっかり噛めることが大事)、要介護や死亡のリスク軽減させる可能性が示唆されました。
- 壮年期からお口の健康を意識し、維持向上していく事が大事です。

Effect of oral health on functional disability and mortality in older adults in Japan: a cohort study

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Summary

Background Oral health has previously shown associations with functional disability and mortality. We aimed to explore the associations of various aspects of oral health status with functional disability and mortality using survival analysis, as well as the relative magnitudes of the impact of these aspects on outcomes.

Methods We obtained data for individuals aged 75 years and older in Shimane, Japan, who had at least one oral health check-up between April 1, 2016, and March 31, 2022 under Japan's long-life medical care system insurance system. Those with missing data or with functional disability at baseline were excluded. 13 aspects of oral health status were assessed by dentists or dental hygienists as part of the check-up (using protocols provided by the Japan Dental Association and the Japanese Ministry of Health, Labour and Welfare): number of remaining teeth, subjective masticatory performance, objective masticatory performance, periodontal tissue status, functional dysphagia, tongue mobility, articulation, oral hygiene, number of decayed teeth, inadaptation of dentures of the upper jaw and lower jaw (considered separately), oral mucosal disease, and dry mouth. Multivariate Cox proportional hazards models were used to analyse the associations between each aspect of oral health and functional disability and mortality, with fully adjusted models adjusting for sex, age, BMI, medical history, or a propensity score derived from these covariates. Population-attributable fractions (PAFs) were calculated to assess the differential impacts of these oral health status aspects on outcome occurrence.

Findings Of the 24 619 individuals who had an oral health check-up during the study period, 23 881 individuals were included in the analysis of functional disability (9175 [41.93%] men, 12 706 [58.07%] women, mean age 78.31 years [SD 2.88], mean follow-up 41.43 months [20–89]), and 22 747 individuals in the analysis of mortality (9722 [42.74%] men, 13 025 [57.26%] women, mean age 78.34 years [2.89], mean follow-up 42.63 months [20–58]). All 13 aspects of oral health status showed significant associations with the occurrence of mortality, while functional disability was associated with 11 aspects (excluding oral mucosal disease and dry mouth) in the fully adjusted model. Based on PAFs, of all oral health aspects assessed, objective masticatory performance had the greatest impact on both functional disability (PAF 23.10% [95% CI 20.42–25.69]) for the lowest and 10.62% [8.18–12.99] for the second-lowest quartile of performance) and mortality (16.47% [13.44–19.40] and 8.90% [5.87–11.82]).

Interpretation Various aspects of oral health are associated with mortality and functional disability. Maintaining good oral health in older adults might help to reduce these outcomes.

Funding Notes.

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Introduction

Despite the widespread prevalence of oral diseases, which affect more than 3.5 billion people worldwide,¹ oral health has been neglected in clinical practice.² Therefore, WHO has set a target of achieving universal health coverage for oral health across its member states by 2030.³ Japanese health care is bolstered by the country's universal health insurance system.⁴ The 8020 Campaign, championed by the Japan Dental Association and the Japanese Ministry of Health, Labour and Welfare, aims to encourage individuals to maintain 20 or more teeth until at least 80 years of age.⁵ Consequently, the oral health status of older Japanese adults has substantially improved,⁶ albeit with regional

disparities.⁷ Oral care promotion through universal health coverage is challenging due to inequalities in oral health, both in Japan and worldwide.⁸

In the context of global ageing, ensuring oral health in old age is crucial for maintaining health and longevity.⁹ In Japan, a country with a rapidly ageing population, poor oral health was reported to increase health-care costs and the risks of aspiration pneumonia and Alzheimer's disease.¹⁰ Moreover, oral health problems are associated with poorer physical function and a greater decline in physical function in older adults.¹¹ The concept of oral frailty—recognised as an aggregated representation of oral health issues—is associated with severe physical conditions that increase



Lancet Healthy Longevity 2024

Published Online

<https://doi.org/10.1016/j.ohle.2024.100442>

1 Jan 2024, 5(1):1–10

See Comment on <https://doi.org/10.1016/j.ohle.2024.100442>

For the Japanese translation of the abstract see Online for appendix 1

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今回、こういった雑誌に掲載されたのか？

『*The Lancet*』(ランセット)は、週刊で刊行される査読制の医学雑誌です。同誌は世界で最もよく知られ、最も評価の高い世界五大医学雑誌の一つです。



THE LANCET
Healthy Longevity

姉妹雑誌
2020年10月創刊

Wikipediaより

- 世界をリードする老年学・老年医学の雑誌
- 同分野74誌中ランキング2位
- 臨床に焦点を当てた長寿と健康的な老化に関する研究とレビューを掲載

島根大学研究・学術情報本部地域包括ケア教育研究センター安部 孝文
島根県後期高齢者医療広域連合・島根県歯科医師会報告会2024年10月10日説明資料より一部改変

THE LANCET



THE LANCET Healthy Longevity

2019年 歯科口腔の健康に関する特集

- Oral health at a tipping point. Lancet. 2019 Jul 20;394(10194):188.
- Oral diseases: a global public health challenge. Lancet. 2019 Jul 20;394(10194):249-260.
- Ending the neglect of global oral health: time for radical action. Lancet. 2019 Jul 20;394(10194):261-272.

- Oral health for healthy ageing. Lancet Healthy Longev. 2021 Aug;2(8):e521-e527.

口腔の健康は健康と幸福の本質的な要素ですが、世界の保健課題では口腔の健康はほとんど見過ごされています。口腔疾患のほとんどは予防または治療可能ですが、高齢者は口腔の健康水準を維持するために必要な日常的なケアを受けていないことがよくあります。口腔の健康を無視することは、世界の保健政策の失敗であり、高齢者の基本的人権の実現の失敗です。(中略)私たちは、今後数十年にわたって予測される課題に対処し、余生を健康な状態で過ごせるようにし、世界的な高齢化を負担ではなく人類の大きな成果として位置づけるために、緊急の行動を求めます。



2022年

世界の口腔保健状況報告書：**2030年までに口腔保健のユニバーサル・ヘルス・カバレッジを実現**

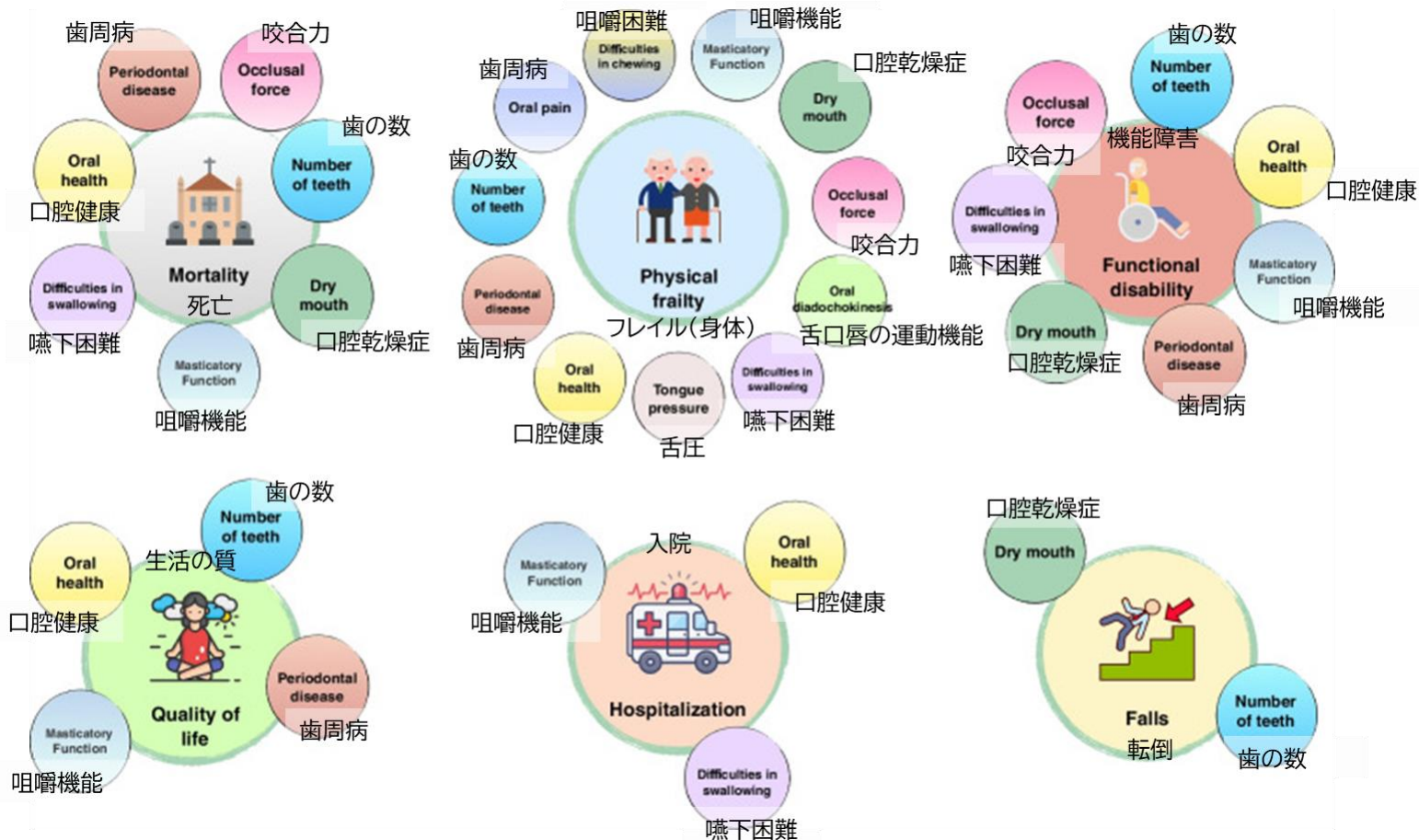
ユニバーサル・ヘルス・カバレッジ（UHC）とは、すべての人が経済的な困難を伴うことなく、必要な時に、必要な場所で、質の高い保健医療サービスを受けられる状態

口腔保健におけるUHCは、すべての人が適切な歯・口の健康保持や予防、治療等に関するサービスを支払い可能な費用で受けられる状態を目指す。

<https://www.icd-japan.gr.jp/pub/vol53/27-vol53.pdf>

様々な口腔の健康状態と機能障害および死亡との関連を報告した研究は少ない。また、口腔の各側面の影響度に関する議論も少ない。

Dibello V, Lobbezoo F, Lozupone M, Sardone R, Ballini A, Berardino G, Mollica A, Coelho-Júnior HJ, De Pergola G, Stallone R, Dibello A, Daniele A, Petruzzi M, Santarcangelo F, Solfrizzi V, Manfredini D, Panza F. Oral frailty indicators to target major adverse health-related outcomes in older age: a systematic review. *Geroscience*. 2023 Apr;45(2):663-706.



研究の内容

- この研究では、《起きる, 起きない》ということに対して影響する要因を調べる「生存分析」を使って、**口腔の健康状態**のさまざまな側面と**機能障害**(要介護2以上)および**死亡**との**関連性**を調べました。
- また、人口寄与率 (PAF) を使って、様々な**口腔の健康状態**が両アウトカム(**機能障害・死亡**)に与える**影響**を評価しました。

人口寄与率（PAF）とは

- 集団における罹患および死亡に対する危険因子の影響力の大きさを測る指標。
- 特定のリスク要因に曝露されないと仮定した場合に、減少できる部分の割合で表します。（例：喫煙がなければどれだけのがんが予防できたか）

方法

- 島根県で実施された後期高齢者歯科口腔健康診査(以下LEDO健診)のデータを使用し、2016年4月1日から2022年3月31日までのLEDO健診受診者の内、ベースラインでデータの欠損や機能障害のある人を除いた**21881人**分の個人のデータを用いて分析しました。
- 口腔の健康状態として**歯の数、主観的および客観的な咀嚼能力、歯周組織の状態、機能的嚥下障害、舌の可動性、構音機能、口腔衛生、未処置歯、上顎または下顎の義歯の不適合、口腔粘膜疾患、および口腔乾燥症**を評価しました。
- 性別、年齢、BMI、病歴、これらの共変量から得られた傾向スコアの調整も行いました。
- PAFを計算して、これらの口腔の健康状態の側面が結果の発生に及ぼす異なる影響を評価しました。

影響度の高い順（PAF）

| | 機能障害（要介護2以上） | 死亡 |
|----|--------------------|--------------------|
| 1位 | 客観的な咀嚼機能（最低①、低②） | 客観的な咀嚼機能（最低①、低②） |
| 2位 | 歯周組織の状態（中程度③） | 歯の数（1-9歯③、10-19歯④） |
| 3位 | 歯の数（1-9歯④、10-19歯⑤） | 主観的な咀嚼機能（低⑤） |
| 4位 | 口腔衛生（低⑥） | 歯周組織の状態（中程度⑥） |
| 5位 | 主観的な咀嚼機能（低⑦） | 下顎の義歯の不適合（あり⑦） |

機能障害と死亡に悪影響を及ぼす事は？

| | 機能障害（要介護2以上） | 死亡 |
|----|---------------|---------------|
| 1位 | しっかり噛めていない | しっかり噛めていない |
| 2位 | 中等度以上の歯周病 | 歯の数が少ない |
| 3位 | 歯の数が少ない | 本人が噛めないと思っている |
| 4位 | 口腔衛生状態が悪い | 中等度以上の歯周病 |
| 5位 | 本人が噛めないと思っている | 下の入れ歯が合っていない |

今後の展望と課題

- LEDO健診の項目によって、介護認定(要介護2以上)または死亡の早期の発生を予測する。
- LEDO健診受診者を増やし、早期治療へ繋げることが重要。
- 「しっかり噛めている事」が、介護認定や死亡の発生を回避する上で優先度の高い指標である可能性があり、グミ検査を介護予防事業等で活用する事を目指す。

今後の展望と課題

- 口腔健康状態が改善した場合の介護認定や死亡発生への影響は今後検証が必要です。
- 口腔の健康に対する早期(前期高齢)の介入効果についても今後検証が必要ですが、後期高齢まで口腔健康状態を良好に保つ必要性は示唆しています。
- オーラルフレイルのように、同時進行的に口腔健康状態を損なっている可能性もあるので今後検討が必要です。

むすび

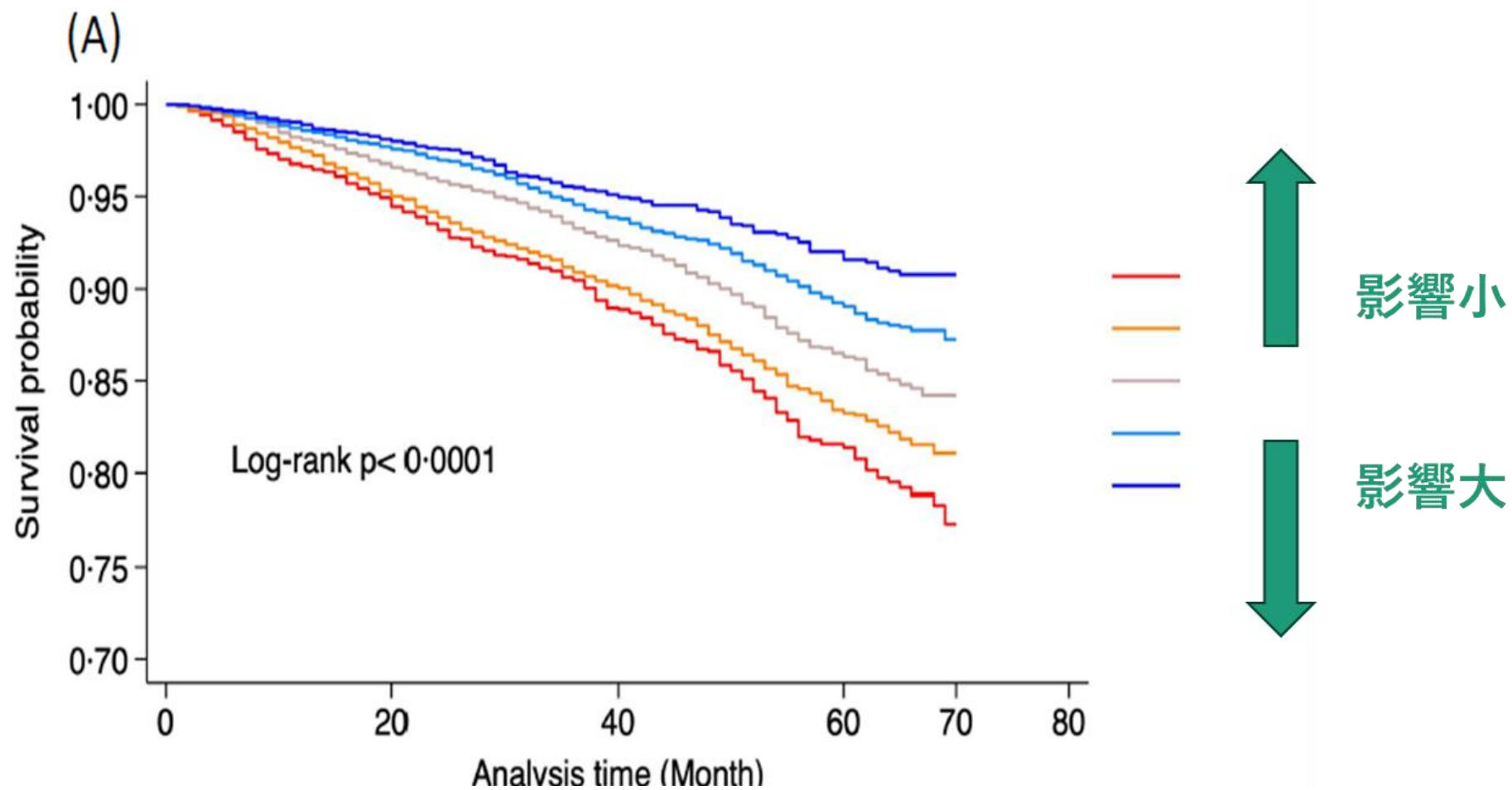
今回の研究で、高齢者の口腔の不健康は、早期介護認定や死亡の発生と関連があり、特に「**しっかり噛めている事**」が大切である事が解りました。

あわせて「**歯の数**」も非常に重要な要素であることも解りました。

歯を失わない為の対策は、高齢者になってからでは遅いので、子どもの頃から高齢者になるまでのすべてのライフステージで強化する必要がある事も知って頂きたいと思います。

參考資料

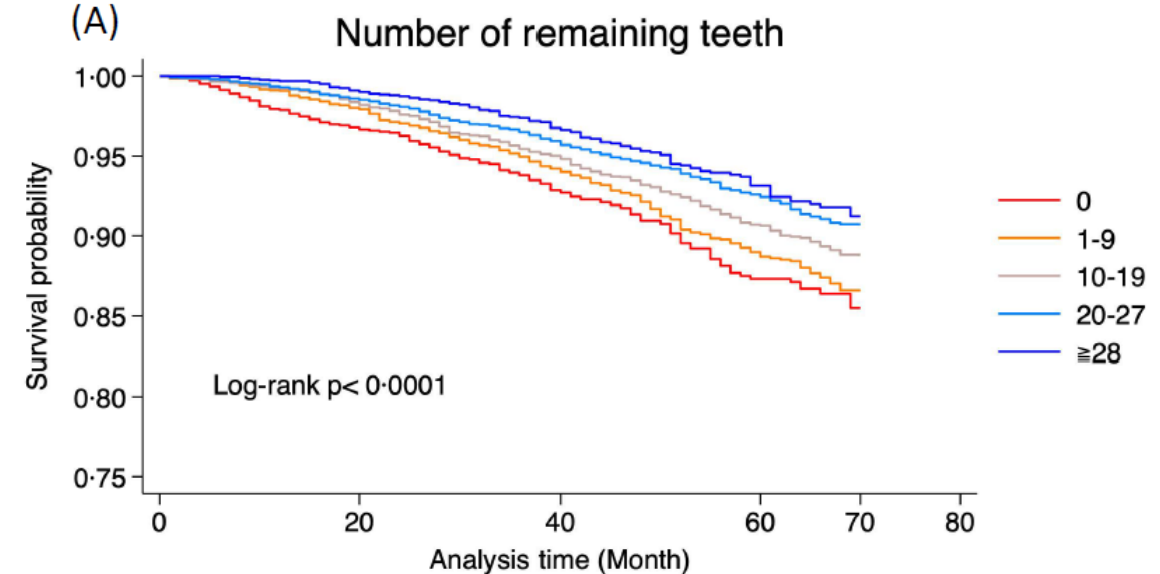
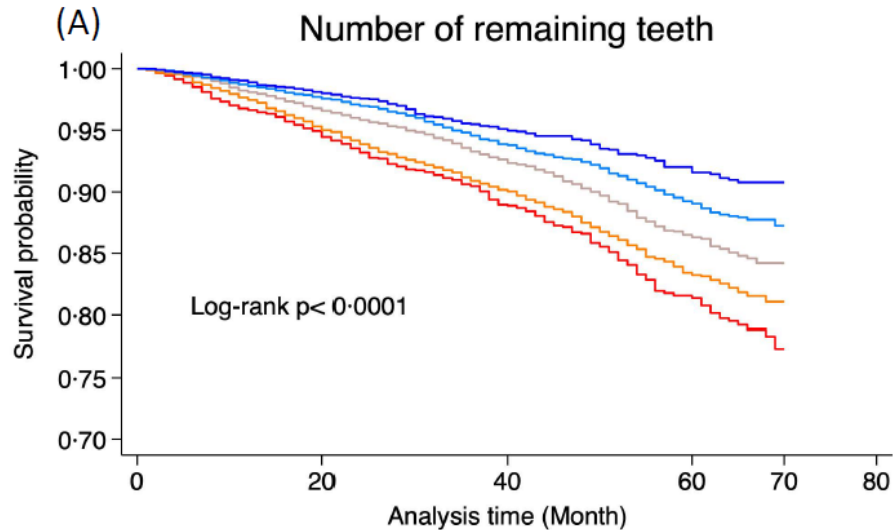
グラフの見方



歯の数

機能障害(介護認定2以上)

死亡



| Number at risk (number censored) | | 20 | 40 | 60 | 70 |
|----------------------------------|----------|------------|------------|------------|--------|
| ≥28 | 2412 (0) | 1839 (41) | 1413 (52) | 620 (34) | 4 (8) |
| 20-27 | 8839 (0) | 6678 (182) | 5138 (239) | 2154 (181) | 7 (37) |
| 10-19 | 5360 (0) | 4122 (156) | 3150 (161) | 1287 (156) | 6 (29) |
| 1-9 | 3490 (0) | 2678 (149) | 2095 (135) | 843 (115) | 3 (19) |
| 0 | 1772 (0) | 1348 (83) | 1039 (79) | 401 (64) | 5 (14) |

| Number at risk (number censored) | | 20 | 40 | 60 | 70 |
|----------------------------------|----------|------------|------------|------------|--------|
| ≥28 | 2488 (0) | 1931 (19) | 1505 (41) | 670 (42) | 5 (10) |
| 20-27 | 9142 (0) | 7027 (114) | 5512 (175) | 2365 (143) | 9 (41) |
| 10-19 | 5584 (0) | 4403 (81) | 3415 (140) | 1439 (117) | 9 (23) |
| 1-9 | 3652 (0) | 2908 (66) | 2327 (105) | 953 (98) | 6 (19) |
| 0 | 1875 (0) | 1470 (56) | 1171 (55) | 466 (51) | 5 (5) |

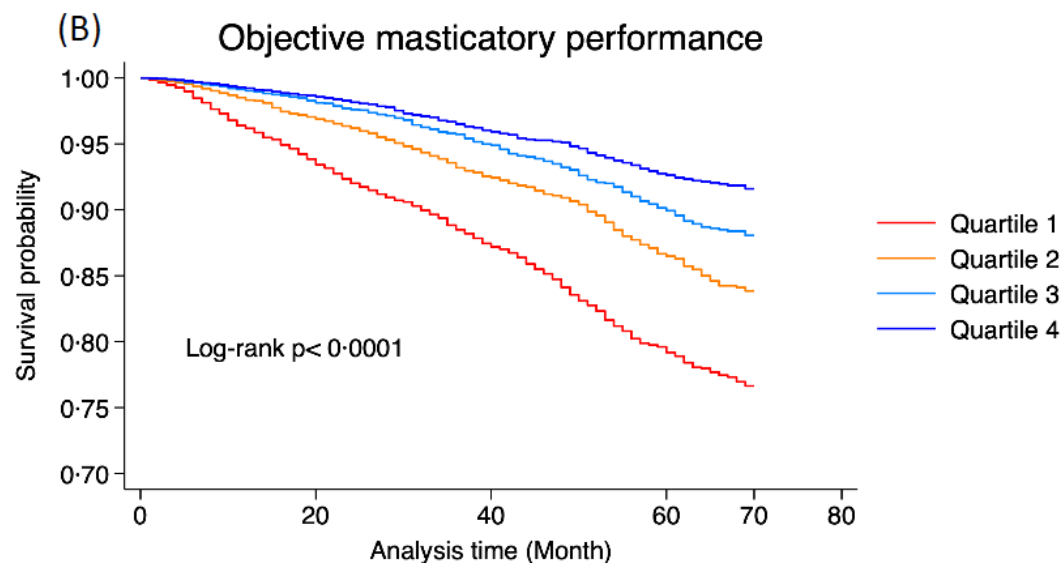
| Number of remaining teeth | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| ≥28 | 2412 | 1.34 (1.13-1.59) | 1 (ref) | 1 (ref) | 1 (ref) |
| 20-27 | 8841 | 1.76 (1.62-1.90) | 1.29 (1.07-1.55) | 1.32 (1.09-1.58) | 1.24 (1.03-1.49) |
| 10-19 | 5363 | 2.25 (2.06-2.45) | 1.55 (1.28-1.87) | 1.51 (1.25-1.83) | 1.49 (1.23-1.80) |
| 1-9 | 3492 | 2.87 (2.60-3.16) | 1.80 (1.48-2.19) | 1.77 (1.46-2.16) | 1.67 (1.37-2.03) |
| 0 | 1773 | 3.30 (2.91-3.74) | 1.86 (1.50-2.31) | 1.77 (1.42-2.20) | 1.50 (1.21-1.87) |

| Number of remaining teeth | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| ≥28 | 2489 | 1.06 (0.88-1.27) | 1 (ref) | 1 (ref) | 1 (ref) |
| 20-27 | 9146 | 1.23 (1.12-1.34) | 1.26 (1.02-1.54) | 1.26 (1.02-1.55) | 1.14 (0.93-1.40) |
| 10-19 | 5584 | 1.51 (1.36-1.67) | 1.52 (1.23-1.88) | 1.49 (1.20-1.85) | 1.36 (1.10-1.68) |
| 1-9 | 3653 | 1.81 (1.61-2.03) | 1.75 (1.40-2.18) | 1.69 (1.36-2.11) | 1.54 (1.24-1.92) |
| 0 | 1875 | 2.08 (1.79-2.42) | 1.85 (1.45-2.36) | 1.76 (1.37-2.25) | 1.63 (1.27-2.09) |

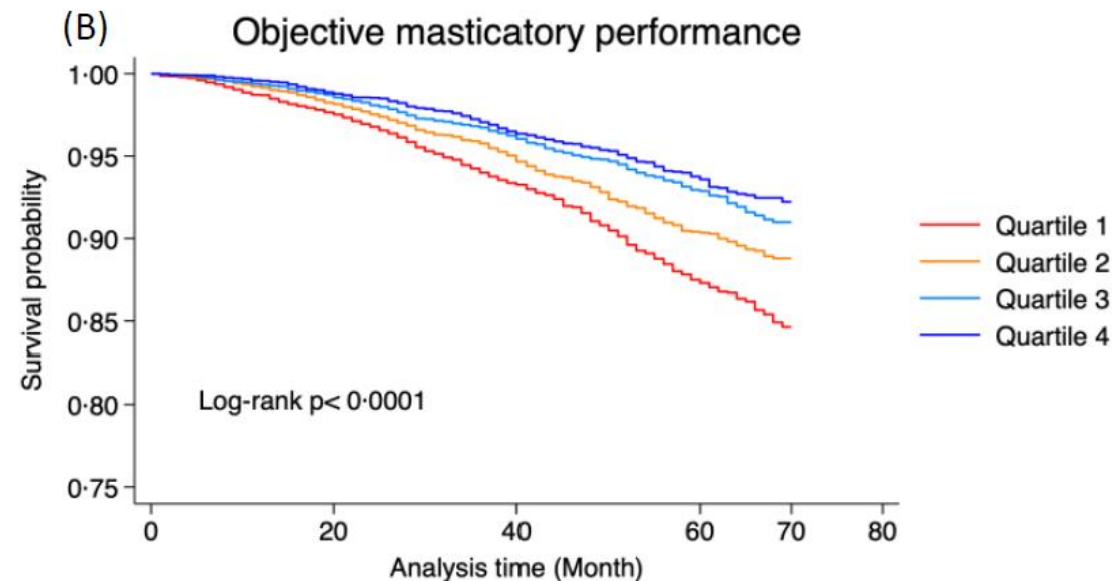
28歯以上に比べ、27歯以下は
機能障害・死亡発生の危険性が高い

客観的な咀嚼能力 機能障害(介護認定2以上)

死亡



| Number at risk (number censored) | 0 | 20 | 40 | 60 | 70 |
|----------------------------------|----------|------------|------------|------------|--------|
| Quartile 4 | 5438 (0) | 4207 (66) | 3357 (103) | 1524 (87) | 4 (14) |
| Quartile 3 | 5207 (0) | 4007 (81) | 3113 (122) | 1266 (115) | 6 (24) |
| Quartile 2 | 5594 (0) | 4323 (150) | 3305 (183) | 1388 (149) | 7 (37) |
| Quartile 1 | 5634 (0) | 4128 (314) | 3060 (258) | 1127 (199) | 8 (32) |

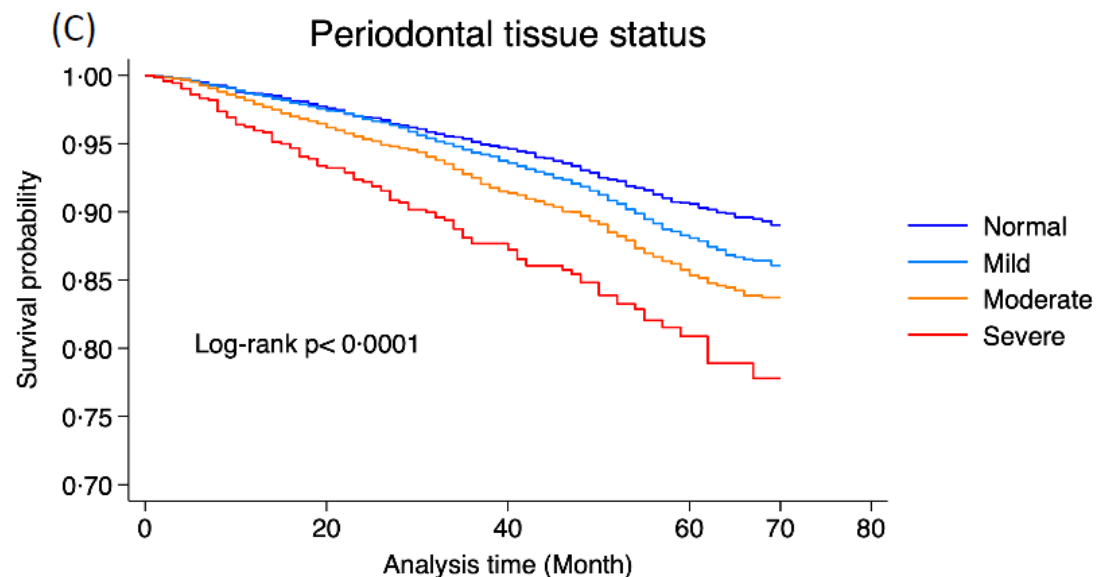


| Number at risk (number censored) | 0 | 20 | 40 | 60 | 70 |
|----------------------------------|----------|------------|------------|------------|---------|
| Quartile 4 | 5612 (0) | 4385 (56) | 3532 (96) | 1619 (77) | 6 (22) |
| Quartile 3 | 5390 (0) | 4199 (62) | 3316 (98) | 1395 (85) | 7 (24) |
| Quartile 2 | 5822 (0) | 4595 (92) | 3582 (138) | 1541 (133) | 9 (22) |
| Quartile 1 | 5917 (0) | 4560 (126) | 3500 (184) | 1338 (156) | 12 (30) |

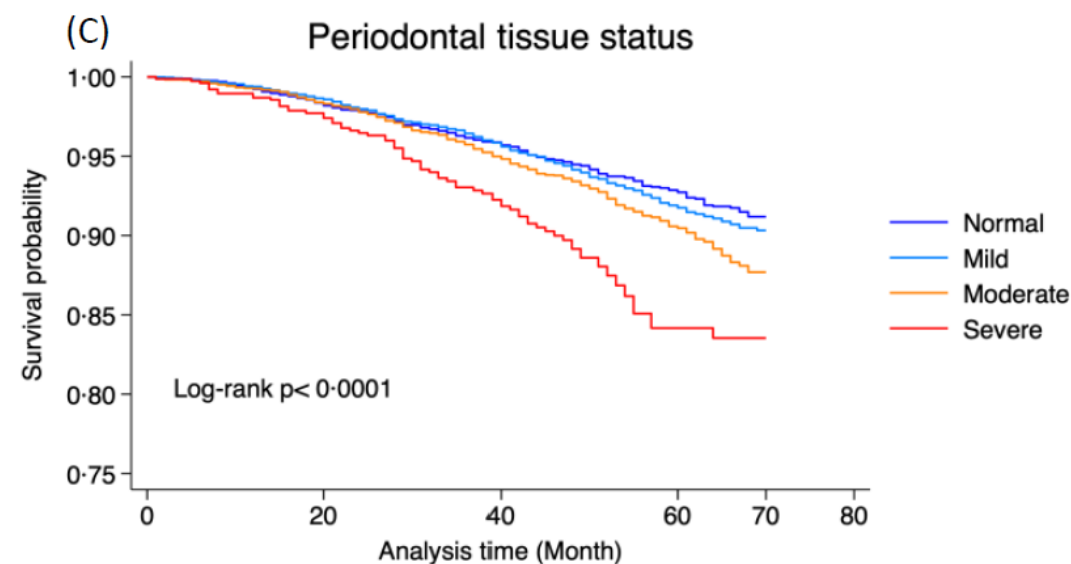
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Objective masticatory performance | | | | | |
| Quartile 4 (highest) | 5438 | 1.15 (1.02-1.29) | 1 (ref) | 1 (ref) | 1 (ref) |
| Quartile 3 | 5207 | 1.57 (1.41-1.74) | 1.34 (1.14-1.57) | 1.29 (1.10-1.51) | 1.25 (1.07-1.47) |
| Quartile 2 | 5595 | 2.22 (2.04-2.42) | 1.84 (1.59-2.14) | 1.71 (1.47-1.98) | 1.65 (1.43-1.92) |
| Quartile 1 (lowest) | 5641 | 3.65 (3.41-3.91) | 2.83 (2.46-3.26) | 2.49 (2.16-2.87) | 2.25 (1.95-2.60) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Objective masticatory performance | | | | | |
| Quartile 4 (highest) | 5614 | 1.02 (0.90-1.16) | 1 (ref) | 1 (ref) | 1 (ref) |
| Quartile 3 | 5393 | 1.17 (1.04-1.32) | 1.20 (1.01-1.42) | 1.17 (0.98-1.39) | 1.14 (0.96-1.35) |
| Quartile 2 | 5822 | 1.54 (1.40-1.70) | 1.58 (1.35-1.86) | 1.53 (1.30-1.79) | 1.48 (1.26-1.74) |
| Quartile 1 (lowest) | 5918 | 2.03 (1.86-2.22) | 2.13 (1.82-2.49) | 1.94 (1.66-2.28) | 1.87 (1.60-2.19) |

最良群(Q4)に比べ、良(Q3)以下は機能障害・死亡発生の危険性が高い



| Number at risk | (number censored) | | | | |
|----------------|-------------------|------------|------------|------------|--------|
| Severe | 719 (0) | 554 (46) | 394 (31) | 123 (21) | 3 (4) |
| Moderate | 6356 (0) | 4783 (202) | 3629 (222) | 1393 (161) | 7 (29) |
| Mild | 8569 (0) | 6459 (188) | 4995 (231) | 2147 (215) | 9 (43) |
| Normal | 4569 (0) | 3599 (94) | 2837 (104) | 1274 (92) | 3 (17) |



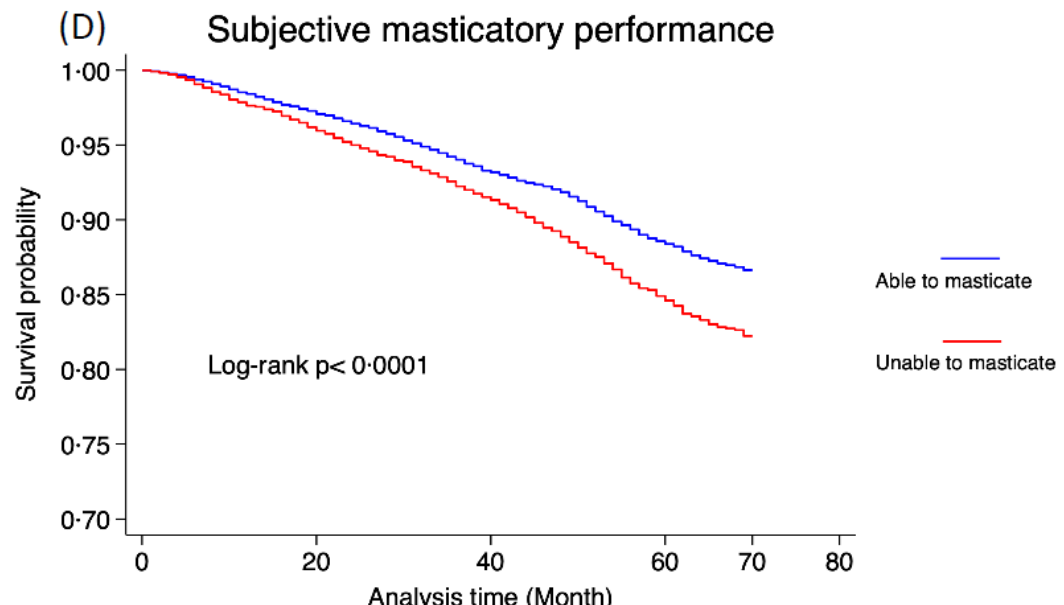
| Number at risk | (number censored) | | | | |
|----------------|-------------------|------------|------------|------------|---------|
| Severe | 764 (0) | 623 (17) | 455 (32) | 145 (28) | 4 (1) |
| Moderate | 6624 (0) | 5129 (94) | 3990 (162) | 1582 (135) | 9 (40) |
| Mild | 8874 (0) | 6827 (106) | 5368 (179) | 2369 (166) | 15 (32) |
| Normal | 4725 (0) | 3773 (69) | 3009 (89) | 1366 (75) | 3 (20) |

| Periodontal tissue status | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Edentulous | 1661 | 3.42 (3.01-3.89) | NA | NA | NA |
| Normal | 4569 | 1.55 (1.39-1.74) | 1 (ref) | 1 (ref) | 1 (ref) |
| Mild level | 8570 | 1.91 (1.77-2.06) | 1.22 (1.06-1.39) | 1.18 (1.03-1.35) | 1.17 (1.02-1.33) |
| Moderate level | 6362 | 2.38 (2.21-2.58) | 1.47 (1.28-1.69) | 1.41 (1.23-1.62) | 1.37 (1.19-1.57) |
| Severe level | 719 | 3.42 (3.01-3.89) | 2.22 (1.78-2.78) | 2.09 (1.66-2.61) | 2.00 (1.60-2.50) |

| Periodontal tissue status | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Edentulous | 1754 | 2.06 (1.76-2.41) | NA | NA | NA |
| Normal | 4726 | 1.22 (1.07-1.38) | 1 (ref) | 1 (ref) | 1 (ref) |
| Mild level | 8878 | 1.28 (1.17-1.40) | 1.06 (0.91-1.23) | 1.04 (0.90-1.21) | 1.02 (0.88-1.19) |
| Moderate level | 6625 | 1.55 (1.41-1.71) | 1.22 (1.05-1.43) | 1.20 (1.02-1.40) | 1.19 (1.02-1.39) |
| Severe level | 764 | 2.41 (1.93-3.00) | 1.86 (1.44-2.39) | 1.82 (1.41-2.35) | 1.82 (1.41-2.35) |

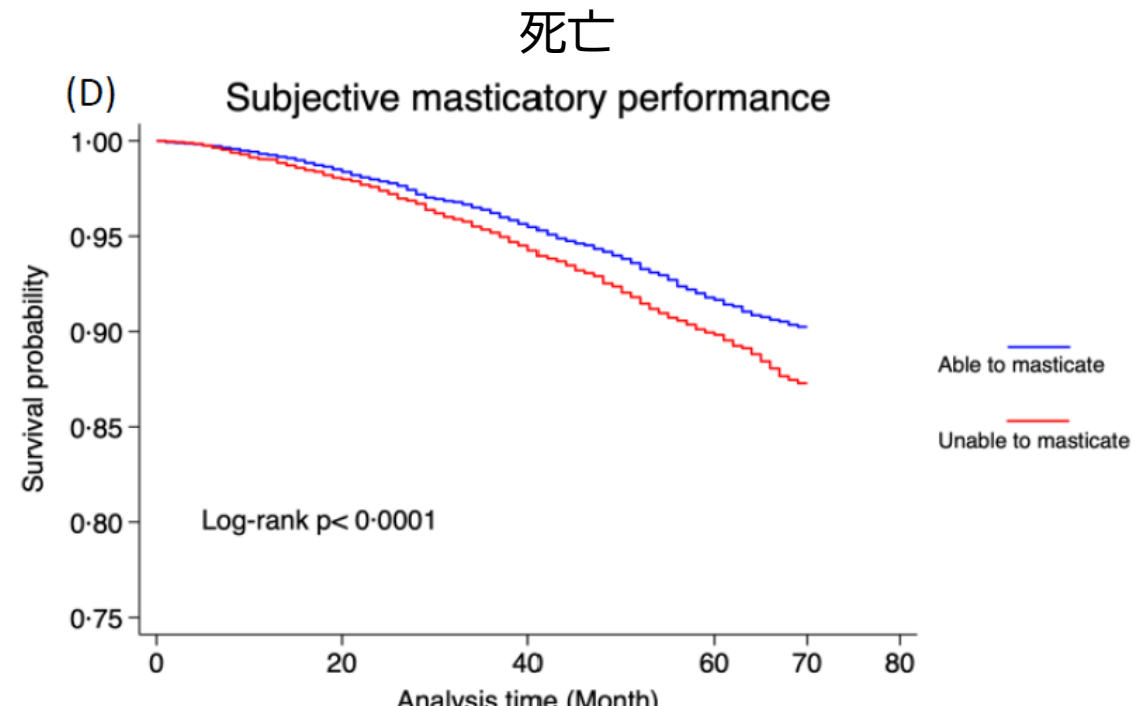
標準(normal)に比べ、軽微以下は機能障害そして中程度以下の死亡発生の危険性が高い

主観的な咀嚼能力 機能障害(介護認定2以上)



Number at risk (number censored)

| | | | | | |
|---------------------|-----------|-------------|------------|------------|---------|
| Unable to masticate | 7037 (0) | 5689 (249) | 4635 (260) | 1932 (250) | 7 (48) |
| Able to masticate | 14836 (0) | 10976 (362) | 8200 (406) | 3373 (300) | 18 (59) |



Number at risk (number censored)

| | | | | | |
|---------------------|-----------|-------------|------------|------------|---------|
| Unable to masticate | 7362 (0) | 6113 (132) | 5076 (209) | 2182 (187) | 10 (48) |
| Able to masticate | 15379 (0) | 11626 (204) | 8854 (307) | 3711 (264) | 24 (50) |

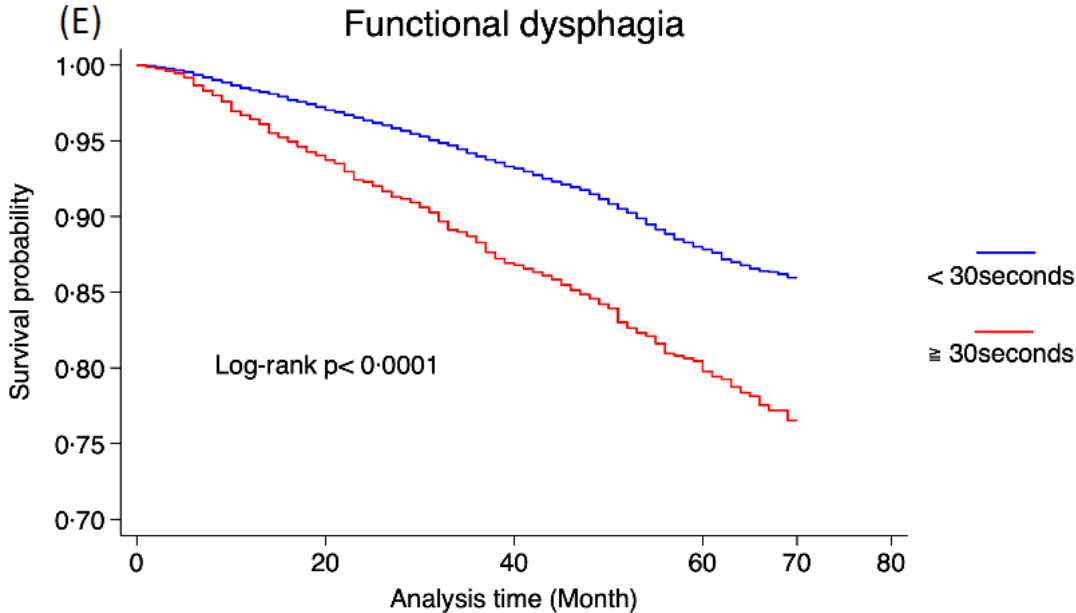
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Subjective masticatory performance | | | | | |
| Able to masticate | 14 841 | 1.89 (1.78-2.01) | 1 (ref) | 1 (ref) | 1 (ref) |
| Unable to masticate | 7040 | 2.60 (2.42-2.78) | 1.25 (1.14-1.37) | 1.20 (1.10-1.31) | 1.21 (1.11-1.33) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Subjective masticatory performance | | | | | |
| Able to masticate | 15 383 | 1.30 (1.22-1.39) | 1 (ref) | 1 (ref) | 1 (ref) |
| Unable to masticate | 7364 | 1.71 (1.58-1.86) | 1.23 (1.11-1.37) | 1.19 (1.07-1.32) | 1.20 (1.08-1.33) |

噛める群に比べ、噛めない群は
機能障害・死亡発生の危険性が高い

機能的嚥下障害

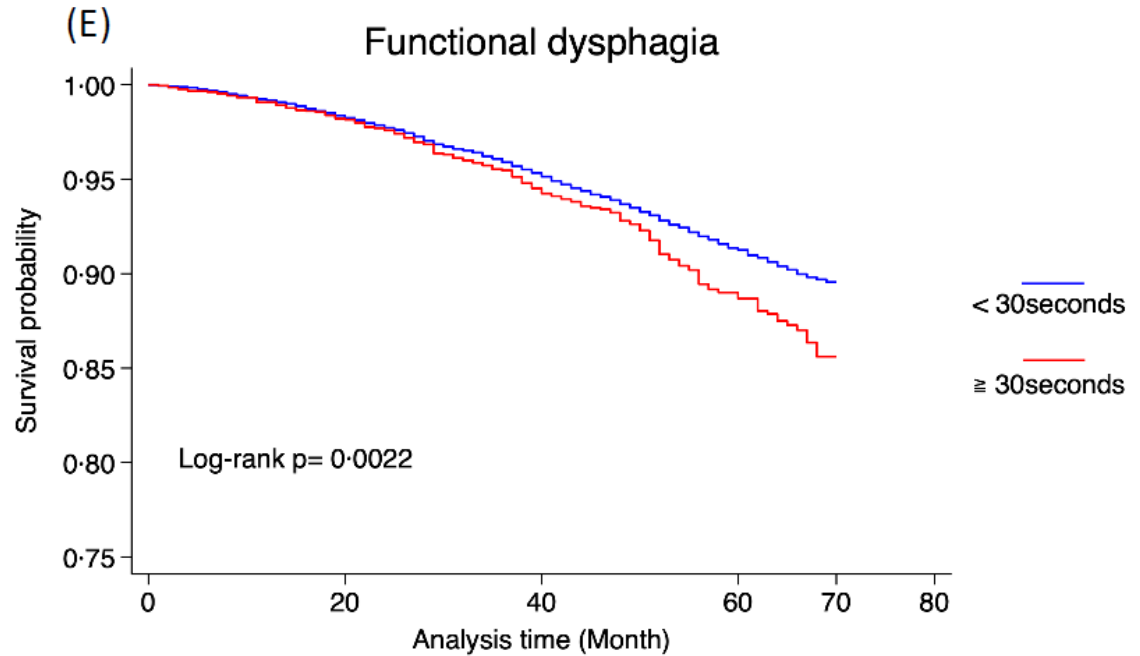
機能障害(介護認定2以上)



Number at risk (number censored)

| | | | | | |
|----------|-----------|-------------|-------------|------------|---------|
| ≧ 30sec. | 2049 (0) | 1583 (113) | 1194 (110) | 468 (66) | 1 (17) |
| < 30sec. | 19824 (0) | 15082 (498) | 11641 (556) | 4837 (484) | 24 (90) |

死亡



Number at risk (number censored)

| | | | | | |
|----------|-----------|-------------|-------------|------------|---------|
| ≧ 30sec. | 2132 (0) | 1730 (35) | 1370 (60) | 544 (59) | 2 (15) |
| < 30sec. | 20609 (0) | 16009 (301) | 12560 (456) | 5349 (392) | 32 (83) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|------------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Functional dysphagia: RSST time, s | | | | | |
| <30 (good) | 19 831 | 1.98 (1.89-2.08) | 1 (ref) | 1 (ref) | 1 (ref) |
| ≥30 (poor) | 2050 | 3.62 (3.24-4.05) | 1.78 (1.57-2.00) | 1.54 (1.36-1.74) | 1.53 (1.36-1.74) |

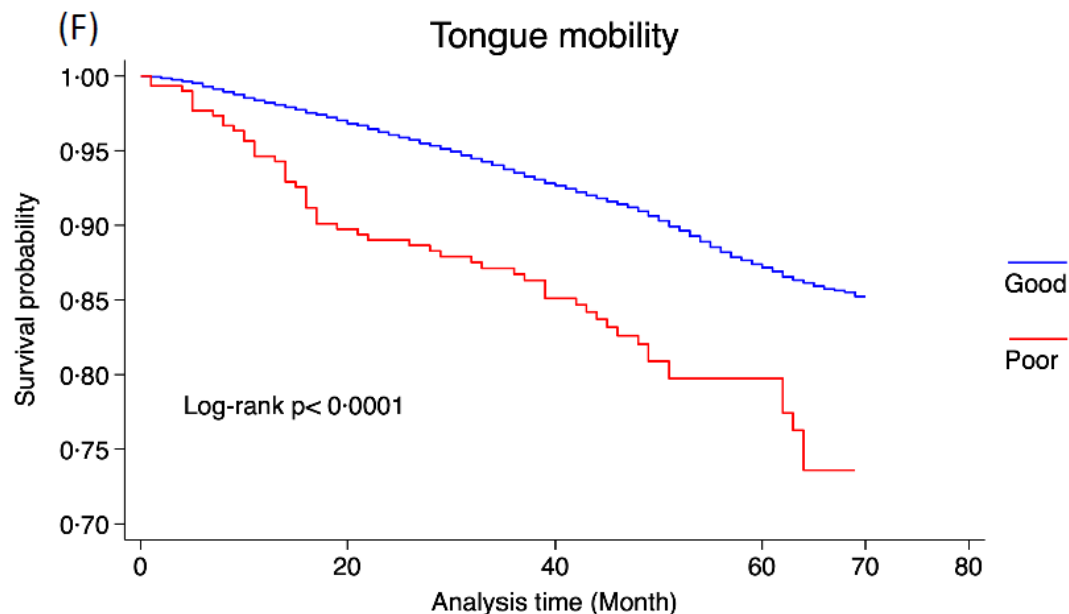
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|------------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Functional dysphagia: RSST time, s | | | | | |
| <30 (good) | 20 614 | 1.14 (1.33-1.49) | 1 (ref) | 1 (ref) | 1 (ref) |
| ≥30 (poor) | 2133 | 1.81 (1.56-2.11) | 1.36 (1.16-1.60) | 1.25 (1.07-1.48) | 1.25 (1.06-1.47) |

良好群に比べ、不良群は機能障害・死亡発生の危険性が高い

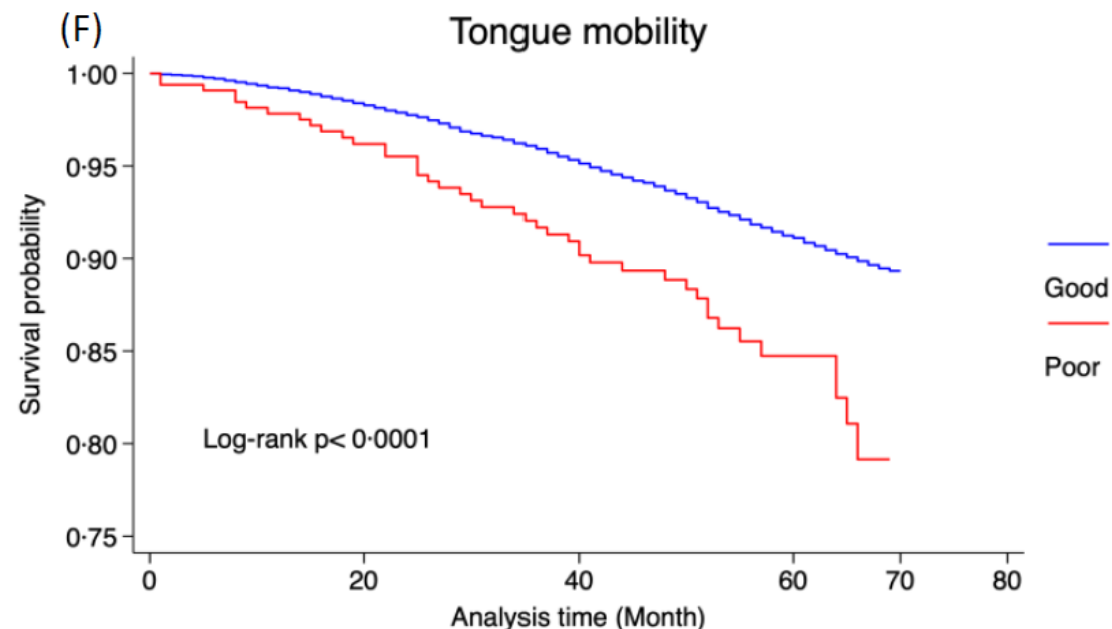
舌の可動性

機能障害(介護認定2以上)

死亡



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|----------|
| Poor | 302 (0) | 246 (30) | 206 (12) | 69 (10) | 0 (5) |
| Good | 21571 (0) | 16419 (581) | 12629 (654) | 5236 (540) | 25 (102) |



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Poor | 326 (0) | 285 (12) | 241 (15) | 85 (12) | 0 (4) |
| Good | 22415 (0) | 17454 (324) | 13689 (501) | 5808 (439) | 34 (94) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Tongue mobility | | | | | |
| Good | 21579 | 2.10 (2.00-2.20) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 302 | 4.32 (3.33-5.61) | 1.94 (1.49-2.52) | 1.52 (1.16-1.99) | 1.59 (1.22-2.08) |

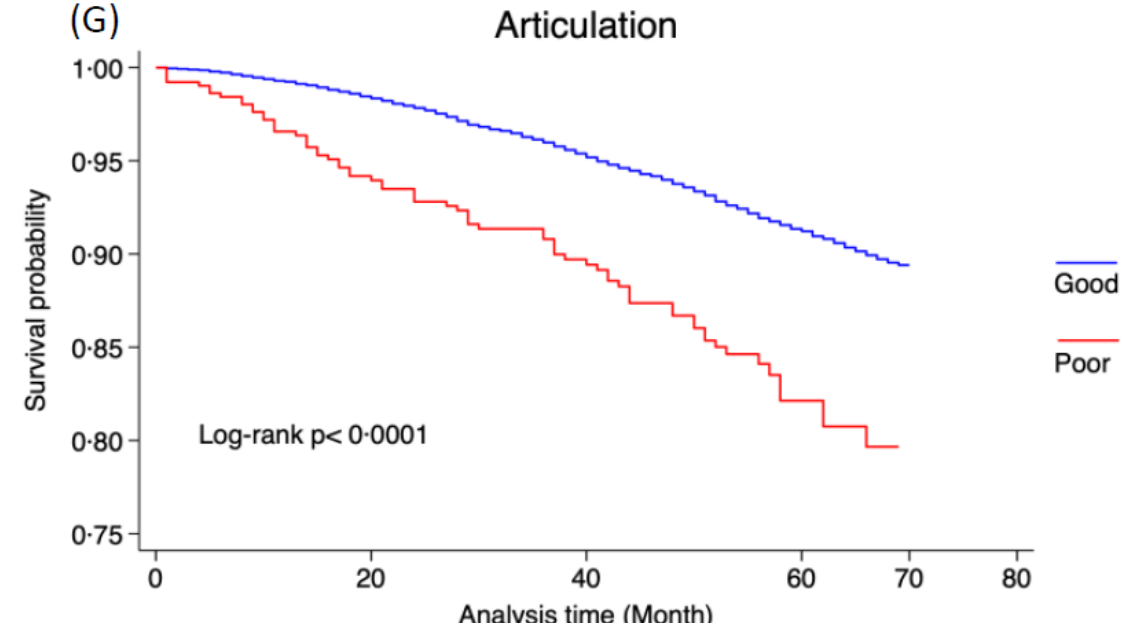
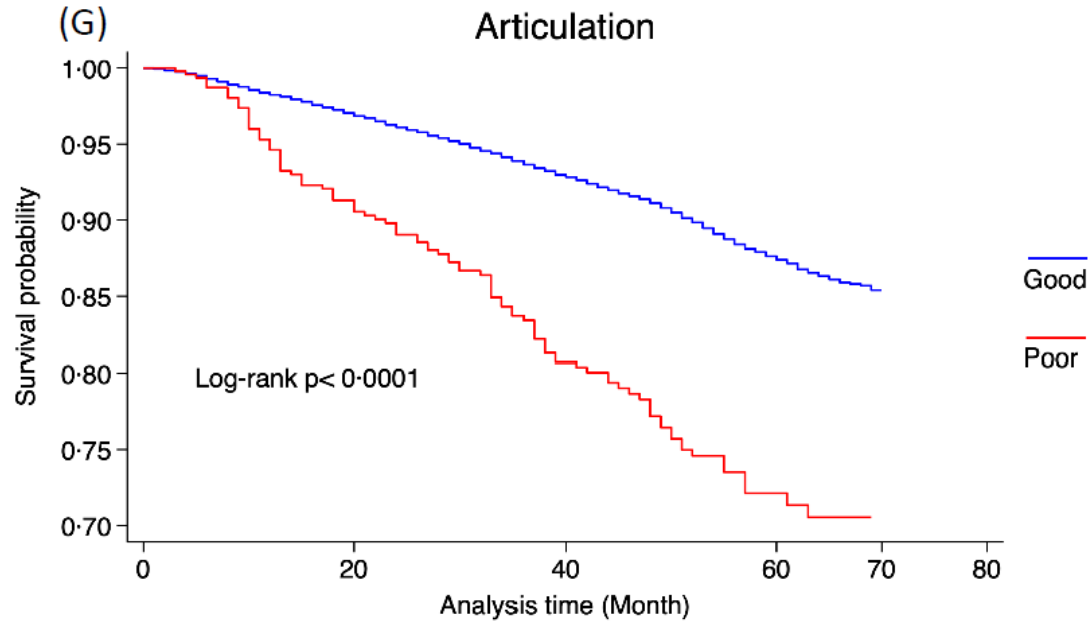
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| rongue mobility | | | | | |
| Good | 22421 | 1.42 (1.35-1.50) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 326 | 2.83 (2.10-3.81) | 1.74 (1.29-2.36) | 1.56 (1.15-2.11) | 1.64 (1.21-2.23) |

良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

構音機能

機能障害(介護認定2以上)

死亡



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|----------|
| Poor | 469 (0) | 363 (38) | 261 (38) | 91 (21) | 0 (2) |
| Good | 21404 (0) | 16302 (573) | 12574 (628) | 5214 (529) | 25 (105) |

| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Poor | 511 (0) | 411 (28) | 319 (18) | 119 (20) | 0 (3) |
| Good | 22230 (0) | 17328 (308) | 13611 (498) | 5774 (431) | 34 (95) |

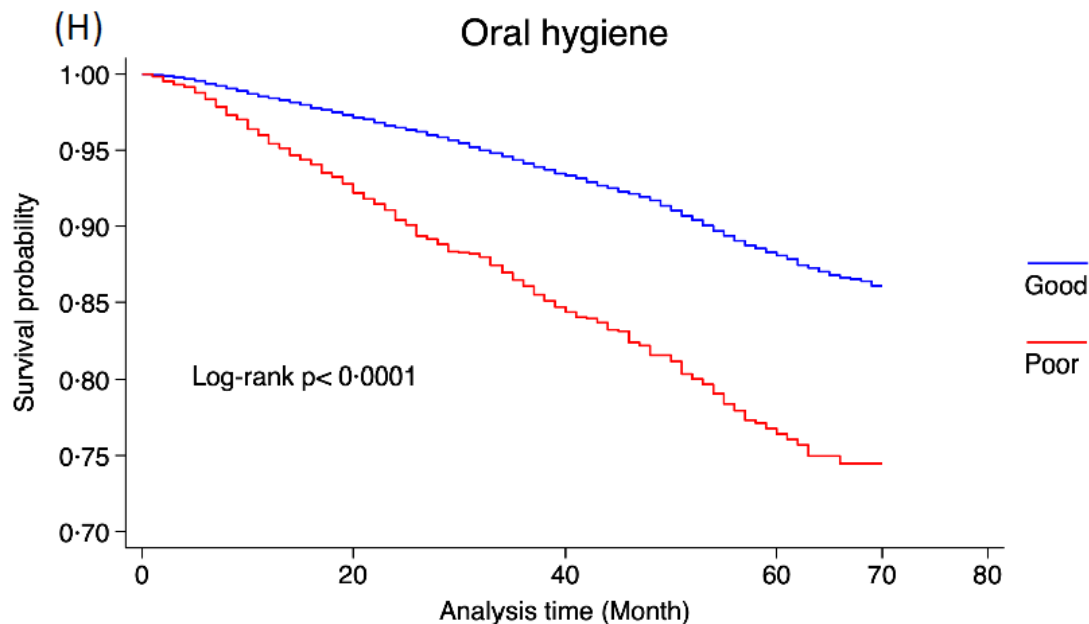
| Articulation | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Good | 21410 | 2.07 (1.97-2.16) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 471 | 5.22 (4.29-6.36) | 2.06 (1.68-2.53) | 1.68 (1.37-2.06) | 1.70 (1.38-2.09) |

| Articulation | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Good | 22236 | 1.41 (1.33-1.48) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 511 | 3.14 (2.48-3.97) | 1.69 (1.32-2.15) | 1.49 (1.17-1.90) | 1.53 (1.20-1.97) |

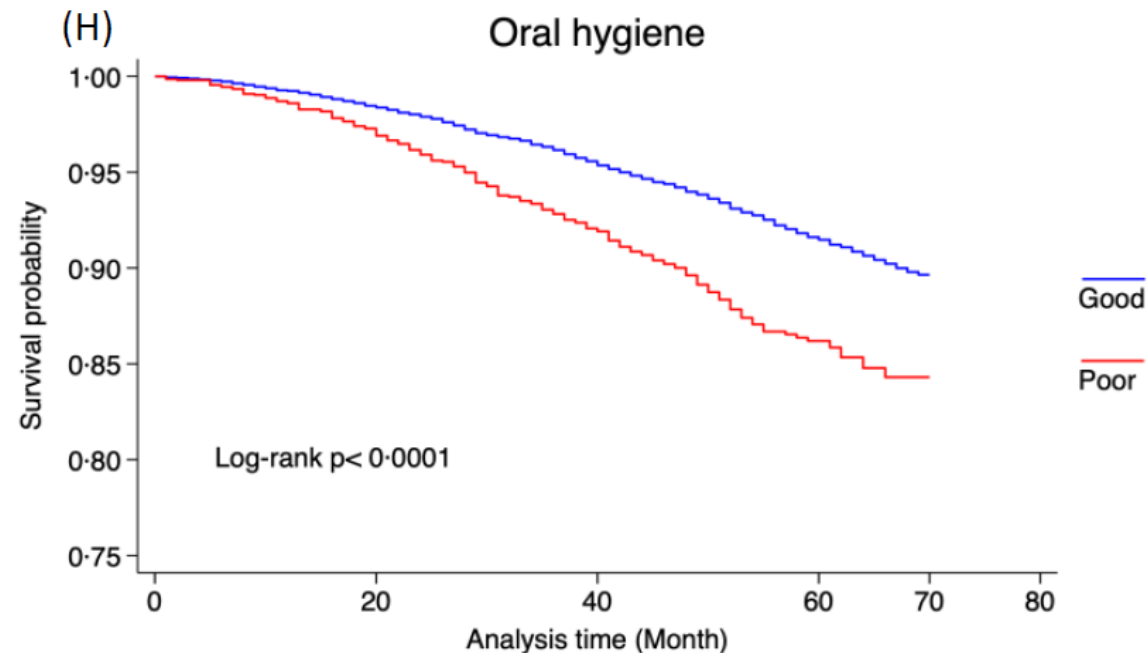
良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

機能障害(介護認定2以上)

死亡



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Poor | 1892 (0) | 1405 (126) | 1029 (113) | 424 (70) | 2(12) |
| Good | 19981 (0) | 15260 (485) | 11806 (553) | 4881 (480) | 23 (95) |



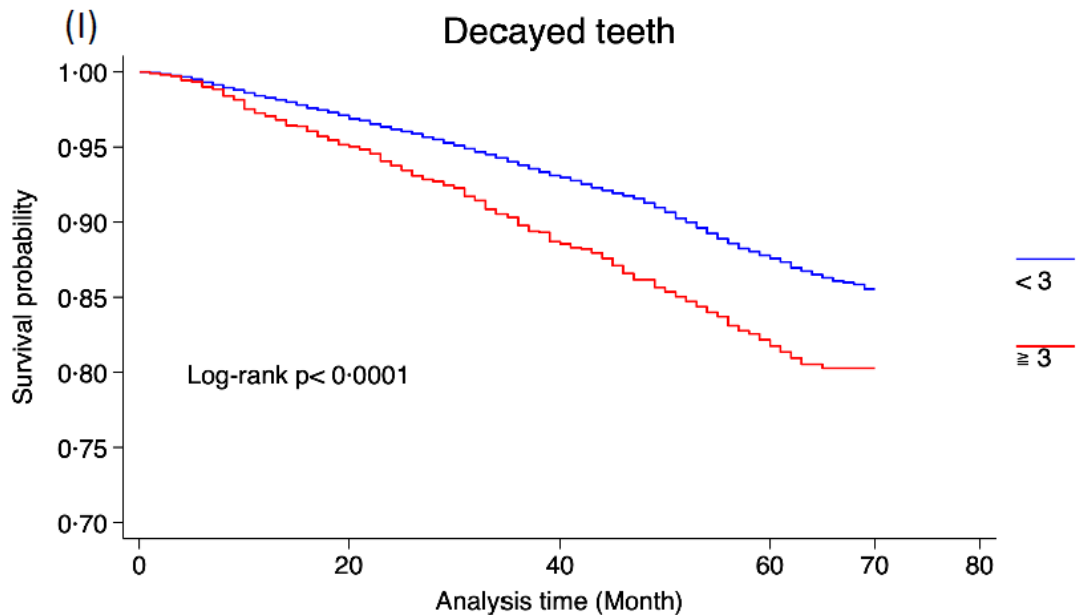
| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Poor | 2003 (0) | 1571 (50) | 1195 (78) | 503 (59) | 4 (10) |
| Good | 20738 (0) | 16168 (286) | 12735 (438) | 5390 (392) | 30 (88) |

| Oral hygiene | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Good | 19987 | 1.94 (1.85-2.04) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 1894 | 4.26 (3.82-4.75) | 2.00 (1.77-2.26) | 1.85 (1.63-2.08) | 1.80 (1.59-2.03) |

| Oral hygiene | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Good | 20 744 | 1.36 (1.29-1.44) | 1 (ref) | 1 (ref) | 1 (ref) |
| Poor | 2003 | 2.33 (2.02-2.68) | 1.44 (1.24-1.68) | 1.36 (1.17-1.59) | 1.40 (1.20-1.63) |

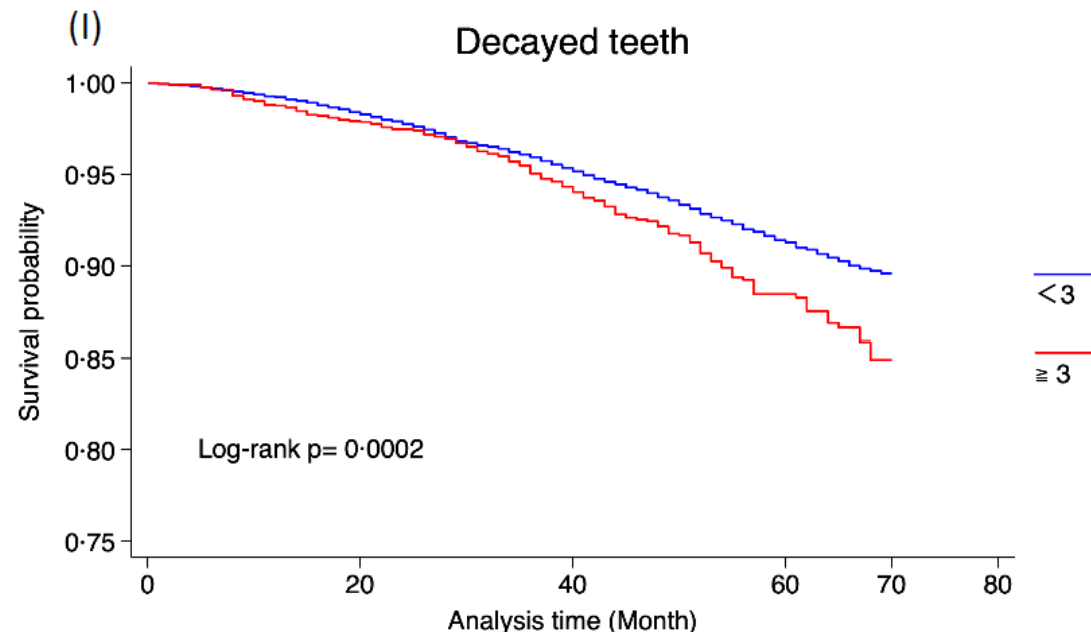
良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

機能障害(介護認定2以上)



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| ≥ 3 | 2149 (0) | 1562 (93) | 1128 (95) | 405 (58) | 7 (9) |
| < 3 | 19724 (0) | 15103 (518) | 11707 (571) | 4900 (492) | 18 (98) |

死亡



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| ≥ 3 | 2247 (0) | 1696 (42) | 1275 (55) | 470 (58) | 10 (13) |
| < 3 | 20494 (0) | 16043 (294) | 12655 (461) | 5423 (393) | 24 (85) |

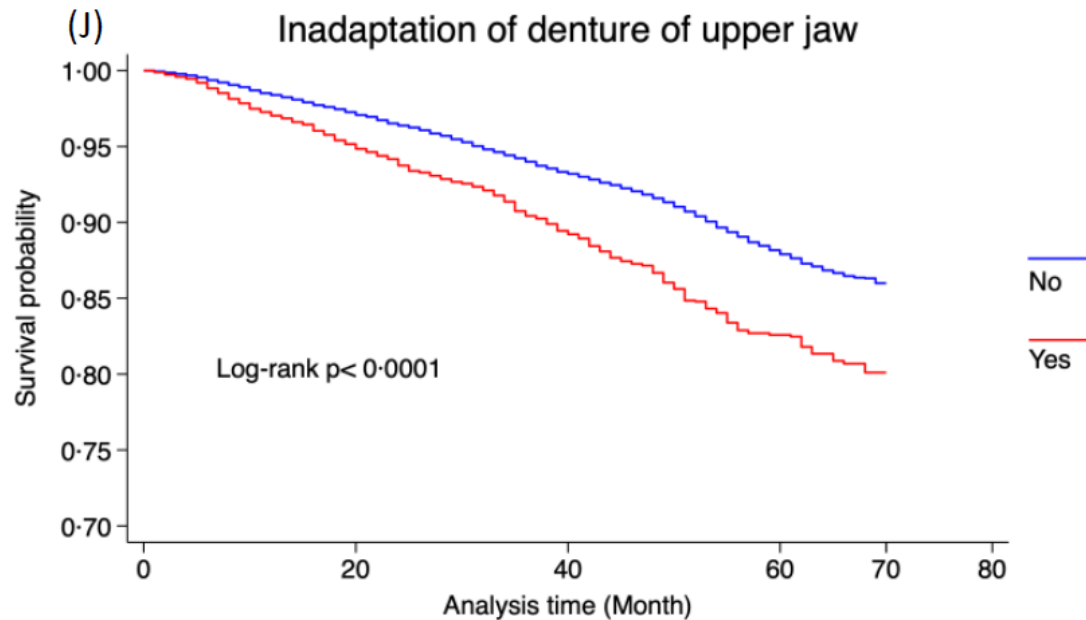
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Number of decayed teeth | | | | | |
| <3 (low) | 19732 | 2.04 (1.94-2.14) | 1 (ref) | 1 (ref) | 1 (ref) |
| ≥3 (high) | 2149 | 3.08 (2.72-3.49) | 1.50 (1.31-1.71) | 1.43 (1.25-1.63) | 1.40 (1.23-1.60) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Number of decayed teeth | | | | | |
| <3 (low) | 20499 | 1.40 (1.33-1.49) | 1 (ref) | 1 (ref) | 1 (ref) |
| ≥3 (high) | 2248 | 1.85 (1.59-2.16) | 1.27 (1.08-1.49) | 1.22 (1.04-1.44) | 1.24 (1.05-1.45) |

3本未満群に比べ、3本以上群は機能障害・死亡発生の危険性が高い

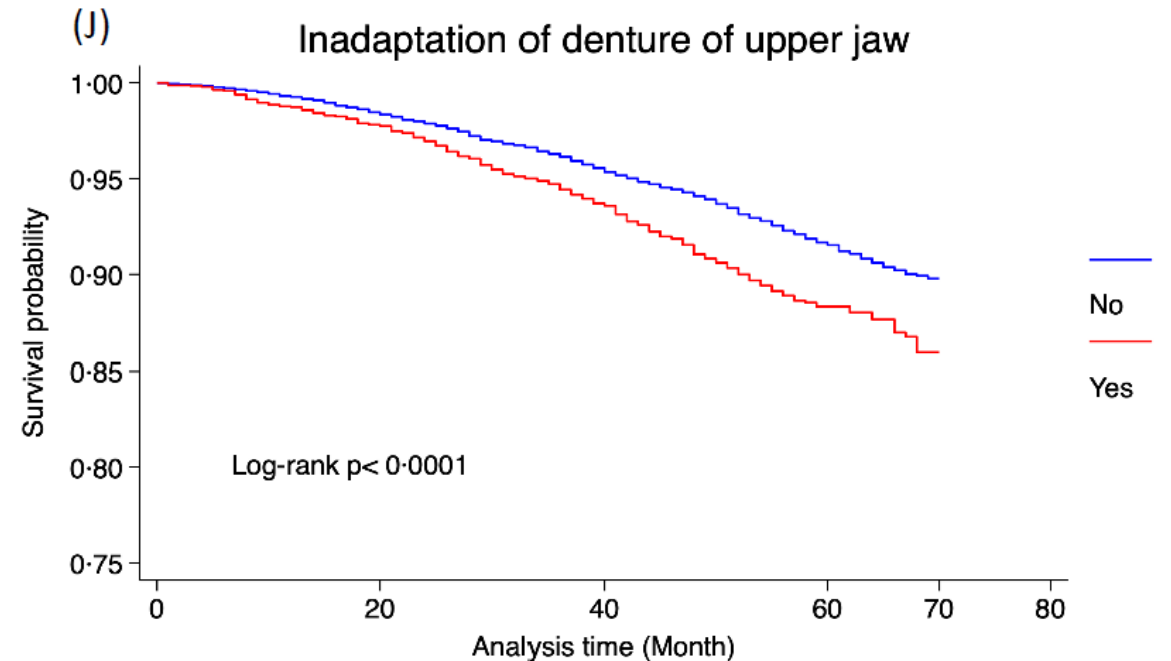
上顎の義歯の不適合

機能障害(介護認定2以上)



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 3682 (0) | 2686 (160) | 1953 (144) | 733 (113) | 1 (17) |
| No | 18191 (0) | 13979 (451) | 10882 (522) | 4572 (437) | 24 (90) |

死亡



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 3858 (0) | 2922 (76) | 2183 (112) | 846 (95) | 2 (14) |
| No | 18883 (0) | 14817 (260) | 11747 (404) | 5047 (356) | 32 (84) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Inadaptation of denture of upper jaw | | | | | |
| No | 18197 | 1.96 (1.87-2.07) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 3684 | 3.04 (2.76-3.34) | 1.46 (1.31-1.62) | 1.45 (1.31-1.62) | 1.38 (1.24-1.53) |

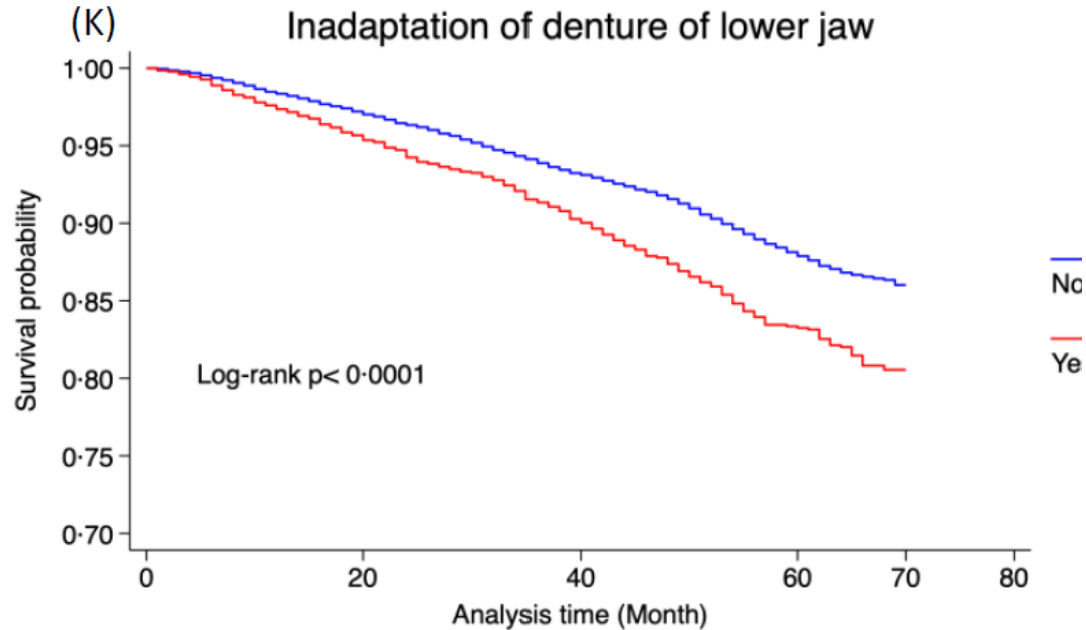
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|---|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Inadaptation of denture of upper jaw | | | | | |
| No | 18888 | 1.36 (1.28-1.44) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 3859 | 1.90 (1.70-2.13) | 1.38 (1.22-1.57) | 1.35 (1.18-1.53) | 1.31 (1.15-1.49) |

良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

下顎の義歯の不適合

機能障害(介護認定2以上)

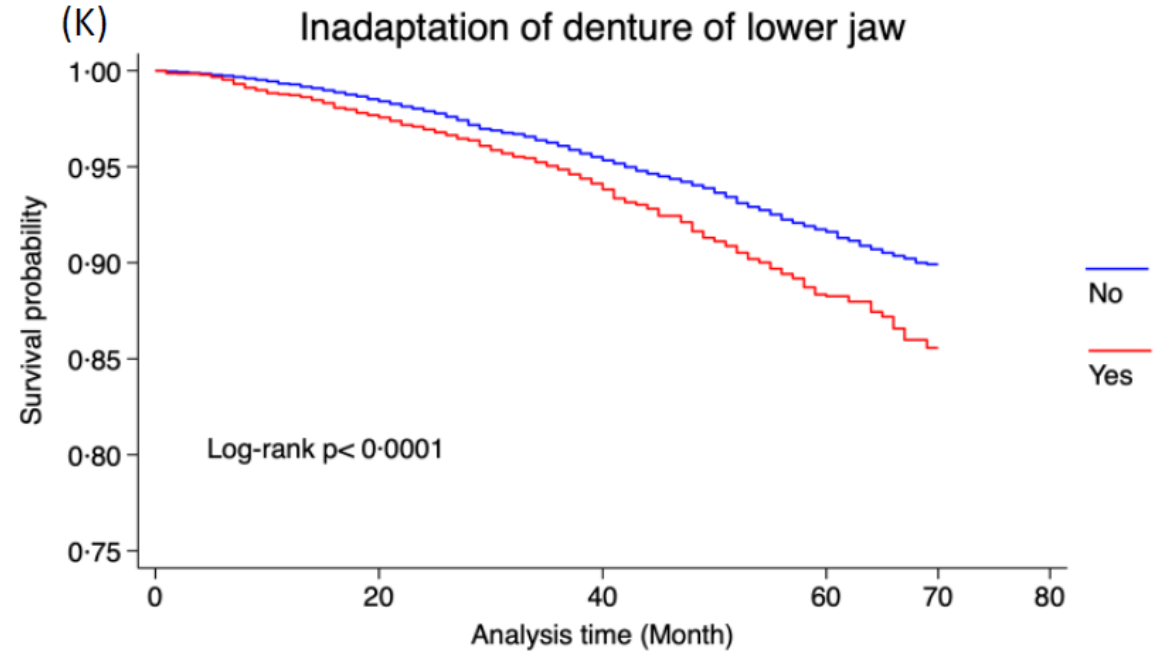
Inadaptation of denture of lower jaw



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 4131 (0) | 3027 (161) | 2230 (153) | 823 (128) | 3 (22) |
| No | 17742 (0) | 13638 (450) | 10605 (513) | 4482 (422) | 22 (85) |

死亡

Inadaptation of denture of lower jaw



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 4327 (0) | 3274 (90) | 2481 (108) | 948 (111) | 5 (19) |
| No | 18414 (0) | 14465 (246) | 11449 (408) | 4945 (340) | 29 (79) |

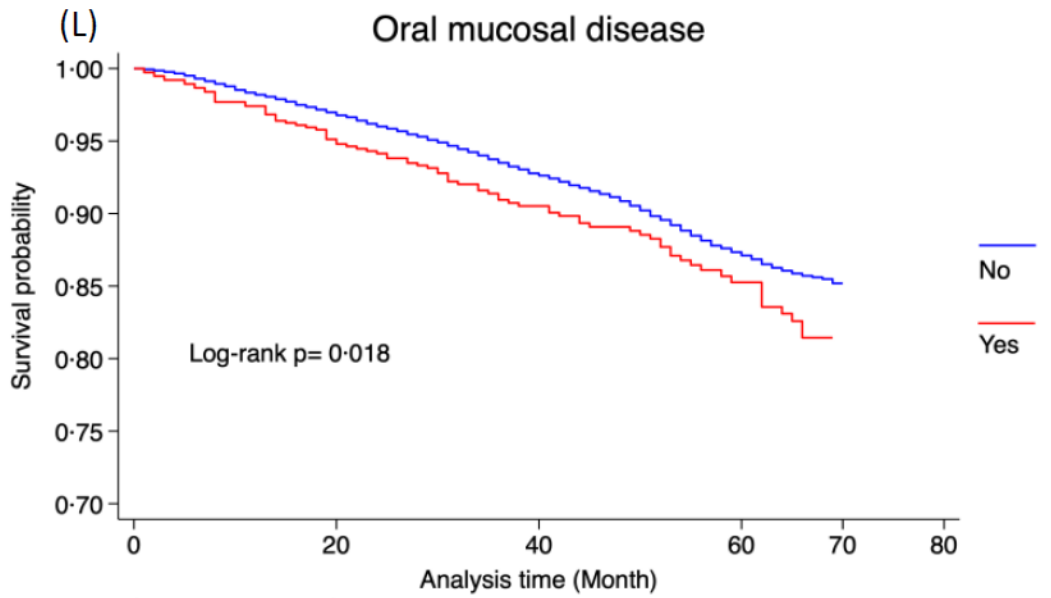
| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Inadaptation of denture of lower jaw | | | | | |
| No | 17747 | 1.97 (1.87-2.08) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 4134 | 2.87 (2.62-3.14) | 1.34 (1.20-1.48) | 1.28 (1.15-1.42) | 1.26 (1.13-1.40) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|--------------------------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Inadaptation of denture of lower jaw | | | | | |
| No | 18419 | 1.35 (1.27-1.44) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 4328 | 1.86 (1.67-2.08) | 1.36 (1.20-1.54) | 1.30 (1.15-1.48) | 1.29 (1.14-1.46) |

良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

口腔粘膜疾患

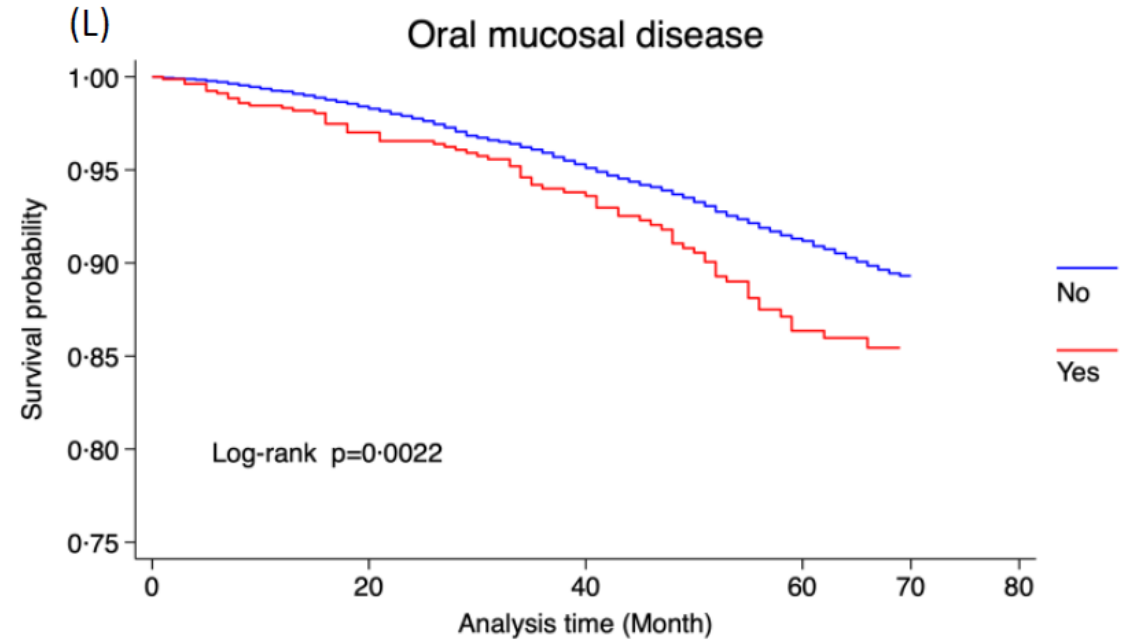
機能障害(介護認定2以上)



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 757 (0) | 580 (34) | 414 (25) | 201 (18) | 0 (8) |
| No | 21116 (0) | 16085 (577) | 12421 (641) | 5104 (532) | 25 (99) |

死亡

Oral mucosal disease



| Number at risk | (number censored) | | | | |
|----------------|-------------------|-------------|-------------|------------|---------|
| Yes | 800 (0) | 626 (22) | 463 (18) | 226 (28) | 0 (2) |
| No | 21941 (0) | 17113 (314) | 13467 (498) | 5667 (423) | 34 (96) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|----------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Oral mucosal disease | | | | | |
| No | 21124 | 2.11 (2.02-2.21) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 757 | 2.74 (2.21-3.38) | 1.38 (1.11-1.72) | 1.31 (1.05-1.62) | 1.23 (0.99-1.53) |

| | Participants, n | Incident functional disability per person-month (95% CI) | Hazard ratio (95% CI) | | |
|----------------------|-----------------|--|-----------------------|------------------|------------------|
| | | | Model 1 | Model 2 | Model 3 |
| Oral mucosal disease | | | | | |
| No | 21946 | 1.42 (1.35-1.50) | 1 (ref) | 1 (ref) | 1 (ref) |
| Yes | 801 | 2.06 (1.63-2.61) | 1.50 (1.18-1.90) | 1.41 (1.11-1.80) | 1.40 (1.10-1.78) |

良好群に比べ、不良群は
機能障害・死亡発生の危険性が高い

謝辞

島根県後期高齢者医療広域連合の皆様、そして本研究に対しご支援ご協力いただいた皆様に厚くお礼を申し上げます。

■ 著者一同

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