

表2 基準年の対象特性と3年後の要介護状態との関連

| 項目 | カテゴリー | 全体(基準年) | | 3年後(n=68) 要介護状態 (あり) | | 3年後(n=533) 要介護状態 (なし) | | χ ² |
|------------|--------|---------|------|----------------------------|------|-----------------------------|------|----------------|
| | | N | % | N | % | N | % | |
| 年齢 | 65~74歳 | 392 | 85.2 | 27 | 6.8 | 365 | 93.1 | *** |
| | 75歳以上 | 208 | 34.8 | 41 | 19.6 | 166 | 80.4 | |
| 性別 | 男 | 268 | 44.3 | 33 | 12.4 | 233 | 87.6 | |
| | 女 | 335 | 55.7 | 35 | 10.5 | 300 | 89.5 | |
| 要介護状態(基準年) | あり | 57 | 9.5 | 26 | 45.8 | 31 | 54.4 | *** |
| | なし | 544 | 90.5 | 42 | 7.7 | 502 | 92.3 | |
| 慢性疾患 | あり | 248 | 41.3 | 34 | 13.7 | 214 | 86.3 | |
| | なし | 353 | 58.7 | 34 | 9.8 | 318 | 90.4 | |
| 移動機能 | 要介助 | 192 | 32.0 | 44 | 22.8 | 148 | 77.1 | *** |
| | 自立 | 409 | 68.0 | 24 | 5.9 | 385 | 94.1 | |
| 感覚機能 | 要介助 | 352 | 58.8 | 49 | 13.8 | 304 | 86.4 | * |
| | 自立 | 249 | 41.4 | 20 | 8.0 | 229 | 92.0 | |
| 身辺処理機能 | 要介助 | 133 | 22.1 | 27 | 20.3 | 106 | 79.7 | ** |
| | 自立 | 468 | 77.9 | 41 | 8.8 | 427 | 91.2 | |

***: p<0.001 ** : 0.001≤p<0.01 * : 0.01≤p<0.05

(n=601)

「期待役割の遂行」では、モデル1でオッズ比3.42、モデル2で2.83、モデル3で2.25と期待役割の遂行ありに比べ、なしでは要介護状態のリスクが有意に高くなる傾向がみられた。また、全調整変数を投入したモデル4でもオッズ比1.89と有意であった。調整変数では、モデル4で年齢、要介護状態(基準年)、移動機能で有意となった(表4)。

「社会貢献の可能性」では、モデル1でオッズ比3.74、モデル2で3.34、モデル3で2.44と社会貢献の可能性ありに比べ、なしでは要介護状態のリスクが有意に高くなる傾向がみられた。また、全調整変数を投入したモデル4でオッズ比2.05と有意であり、要介護状態のリスクが高くなる傾向がみられた。調整変数では、年齢、性別、介護の必要性、移動機能で有意となった(表4)。

一方、生活習慣の項目では有意となった項目は1つも認められなかった。

IV. 考 察

1. 本研究の特徴

本研究の独自性は、介護保険施行後の2002年から2005年という時点での追跡調査により、回答内容が価値観に影響されることの少ない18項目、5領域からなる社会関連性指標を用い、単に社会との関わり頻度、側面を項目ごとに評価するに留まらず、5領域から特徴を把握した点である。また方法論上の強みとして次の2点が挙げられる。第1に、本研究の対象地域

が過疎地域ではなく、中部地方大都市近郊農村であり、各世代がともに居住する人口構成の安定した比較的人口移動の少ない地域であるという点である。本研究では基準年から3年後の調査までの追跡率は84.9%で比較的高かった。このことで、縦断研究の内的妥当性を高く保つことができた。第2に、質問紙回収率88.7%、有効回答率91.5%と高い率でデータが得られた点である。配票留置による調査ではあるが、自治体による健康増進支援の啓発、プログラム実施による住民意識の向上により、高い回収率、回答率につながったと考えられる。

一方、1自治体で実施した結果であり、一般化は限界があるものの、本調査地域が大都市近郊に位置し、2002年、T村人口構成比(年少子人口12.4%、生産年齢人口66.4%、老年人口21.2%、高齢化率21.3%)が全国比(年少子人口14.2%、生産年齢人口67.3%、老年人口18.5%、高齢化率18.5%) (総務省統計局、2006)に類似している点で、慎重に検討しながら成果の活用が期待できる。

2. 3年後の要介護状態に対する要因

本研究は、地域を包括的に捉えた介護予防マネジメントへの成果の活用を目的としている。したがって基準年の要介護状態や日常生活動作の状況にかかわらず、3年後の要介護状態と各説明変数の関連を分析した。これは本研究が介護予防マネジメントの際の地域の全体的な評価への展開を意図し、自宅で生活する高齢者全数を対象としているため、基本特性の要因(年齢、

表3 基準年の社会関連性指標および生活習慣の各項目と3年後の要介護状態との関連

| 項目 | カテゴリー | 全体(基準年) | | 3年後(n=60) 要介護状態 (あり) | | 3年後(n=533) 要介護状態 (なし) | | χ^2 |
|-----------|-------|---------|------|----------------------------|------|-----------------------------|------|----------|
| | | N | % | N | % | N | % | |
| <社会関連性項目> | | | | | | | | |
| 家族との会話 | なし | 101 | 18.8 | 18 | 15.8 | 85 | 84.2 | |
| | あり | 500 | 83.2 | 52 | 10.4 | 448 | 89.8 | |
| 家族以外との会話 | なし | 138 | 23.1 | 18 | 13.0 | 121 | 87.0 | |
| | あり | 482 | 76.9 | 50 | 10.8 | 412 | 88.2 | |
| 訪問・来訪の機会 | なし | 166 | 27.6 | 22 | 13.9 | 144 | 86.7 | |
| | あり | 435 | 72.4 | 48 | 10.6 | 389 | 88.4 | |
| 活動参加 | なし | 272 | 45.3 | 34 | 12.5 | 238 | 87.5 | |
| | あり | 328 | 54.8 | 34 | 10.3 | 295 | 89.7 | |
| テレビの視聴 | なし | 120 | 20.0 | 17 | 14.2 | 103 | 85.8 | |
| | あり | 481 | 80.0 | 51 | 10.8 | 430 | 89.4 | |
| 新聞の購読 | なし | 183 | 30.5 | 27 | 14.8 | 156 | 85.2 | |
| | あり | 418 | 69.5 | 41 | 9.8 | 377 | 90.2 | |
| 本・雑誌の購読 | なし | 346 | 57.8 | 46 | 13.3 | 300 | 86.7 | |
| | あり | 255 | 42.4 | 22 | 8.8 | 233 | 91.4 | |
| 期待役割の遂行 | なし | 213 | 35.4 | 42 | 19.7 | 171 | 80.3 | *** |
| | あり | 388 | 64.6 | 26 | 6.7 | 362 | 83.3 | |
| 相談者あり | なし | 168 | 28.0 | 25 | 14.9 | 143 | 85.1 | |
| | あり | 433 | 72.0 | 43 | 9.9 | 390 | 90.1 | |
| 緊急時の援助者あり | なし | 162 | 27.0 | 24 | 14.8 | 138 | 85.2 | |
| | あり | 439 | 73.0 | 44 | 10.0 | 395 | 90.0 | |
| 近所付き合い | なし | 158 | 26.0 | 20 | 12.8 | 138 | 87.2 | |
| | あり | 445 | 74.0 | 48 | 10.8 | 397 | 89.2 | |
| 興味対象あり | なし | 204 | 33.8 | 34 | 16.7 | 170 | 83.3 | ** |
| | あり | 397 | 66.1 | 34 | 8.6 | 363 | 91.4 | |
| ビデオ等の利用 | なし | 331 | 55.1 | 44 | 13.3 | 287 | 86.7 | |
| | あり | 270 | 44.9 | 24 | 8.9 | 246 | 81.1 | |
| 健康に配慮する | なし | 151 | 25.1 | 21 | 13.9 | 130 | 86.1 | |
| | あり | 450 | 74.9 | 47 | 10.4 | 403 | 89.6 | |
| 規則的な生活 | なし | 147 | 24.5 | 22 | 15.0 | 125 | 85.0 | |
| | あり | 454 | 75.5 | 48 | 10.1 | 408 | 89.9 | |
| 生活の工夫 | なし | 158 | 26.0 | 26 | 18.7 | 130 | 83.3 | * |
| | あり | 445 | 74.0 | 42 | 8.4 | 403 | 90.6 | |
| 積極的に取り組む | なし | 184 | 27.3 | 27 | 18.5 | 137 | 83.5 | * |
| | あり | 437 | 72.7 | 41 | 9.4 | 396 | 90.6 | |
| 社会貢献の可能性 | なし | 211 | 36.1 | 43 | 20.4 | 168 | 79.6 | *** |
| | あり | 390 | 64.8 | 25 | 8.4 | 365 | 83.6 | |
| <生活習慣項目> | | | | | | | | |
| 朝食の摂取 | なし | 76 | 12.7 | 10 | 13.2 | 66 | 86.8 | |
| | あり | 525 | 87.3 | 58 | 11.1 | 467 | 88.8 | |
| 間食控えめ | なし | 290 | 48.3 | 33 | 11.4 | 257 | 88.8 | |
| | あり | 311 | 51.7 | 35 | 11.3 | 276 | 88.7 | |
| 塩分控えめ | なし | 157 | 26.1 | 23 | 14.7 | 134 | 85.3 | |
| | あり | 444 | 73.9 | 45 | 10.1 | 399 | 89.9 | |
| 栄養バランスの配慮 | なし | 181 | 31.8 | 29 | 15.2 | 152 | 84.8 | * |
| | あり | 410 | 68.2 | 38 | 9.5 | 371 | 90.5 | |
| 脂肪分控えめ | なし | 173 | 28.8 | 23 | 13.3 | 150 | 86.7 | |
| | あり | 428 | 71.2 | 45 | 10.5 | 383 | 89.5 | |
| 飲酒 | リスク | 293 | 48.8 | 28 | 9.8 | 265 | 90.4 | |
| | 非リスク | 308 | 51.2 | 40 | 13.0 | 268 | 87.0 | |
| 喫煙 | リスク | 296 | 49.3 | 30 | 12.7 | 266 | 87.3 | |
| | 非リスク | 305 | 50.7 | 38 | 10.4 | 327 | 89.6 | |
| 十分な睡眠 | なし | 114 | 19.0 | 18 | 15.8 | 98 | 84.2 | |
| | あり | 487 | 81.0 | 50 | 10.3 | 437 | 89.7 | |
| 運動の実施 | なし | 308 | 51.4 | 47 | 15.2 | 262 | 84.8 | ** |
| | あり | 292 | 48.6 | 21 | 7.2 | 271 | 92.8 | |

***: $p < 0.001$ **: $0.001 \leq p < 0.01$ *: $0.01 \leq p < 0.05$

(n=601)

表4 社会関連性の項目および調整変数の3年後の要介護状態に対するオッズ比

| 項目 | model 1 | | model 2 | | model 3 | | model 4 | |
|--------------------|---------|-----------|---------|-----------|----------|------------|---------|------------|
| | オッズ比 | 95%信頼区間 | オッズ比 | 95%信頼区間 | オッズ比 | 95%信頼区間 | オッズ比 | 95%信頼区間 |
| 期待役割の遂行 | 3.42*** | 2.03-5.78 | 2.93** | 1.65-4.65 | 2.25** | 1.26-4.00 | 1.99* | 1.04-3.44 |
| 年齢 | | | 1.10*** | 1.09-1.14 | 1.09*** | 1.05-1.14 | 1.08** | 1.03-1.13 |
| 性別 | | | 1.40 | 0.82-2.38 | 1.47 | 0.63-2.60 | 1.65 | 0.92-2.97 |
| 要介護状態(基準年) | | | | | 8.64*** | 4.47-16.70 | 7.14*** | 3.57-14.26 |
| 慢性疾患 | | | | | 1.47 | 0.83-2.61 | 1.49 | 0.84-2.67 |
| 移動機能 | | | | | | | 2.58** | 1.30-5.12 |
| 感覚機能 | | | | | | | 0.81 | 0.41-1.56 |
| 身辺処理機能 | | | | | | | 0.97 | 0.48-1.97 |
| Intercept | -2.6335 | | -9.6291 | | -9.8578 | | -9.2158 | |
| Hosmer-Lemeshow 検定 | — | | 0.4937 | | 0.3727 | | 0.9678 | |
| 社会への貢献 | 3.74*** | 2.21-6.32 | 3.34*** | 1.82-6.60 | 2.44** | 1.36-4.39 | 2.05* | 1.11-3.76 |
| 年齢 | | | 1.10*** | 1.05-1.14 | 1.10*** | 1.05-1.14 | 1.08** | 1.04-1.13 |
| 性別 | | | 1.67 | 0.98-2.68 | 1.64 | 0.92-2.93 | 1.81* | 1.00-3.27 |
| 要介護状態(基準年) | | | | | 7.87*** | 4.09-15.51 | 6.77*** | 3.38-13.58 |
| 慢性疾患 | | | | | 1.57 | 0.89-2.77 | 1.57 | 0.89-2.79 |
| 移動機能 | | | | | | | 2.46** | 1.26-4.90 |
| 感覚機能 | | | | | | | 0.80 | 0.41-1.54 |
| 身辺処理機能 | | | | | | | 0.99 | 0.50-1.99 |
| Intercept | -2.6810 | | -9.784 | | -10.0149 | | -9.3674 | |
| Hosmer-Lemeshow 検定 | — | | 0.2685 | | 0.1150 | | 0.3992 | |

***: $p < 0.001$ ** : $0.001 \leq p < 0.01$ * : $0.01 \leq p < 0.05$

性別)に加えて基準年の介護や医療のニーズ(要介護状態, 慢性疾患), 実際の日常生活動作状況(移動機能, 感覚機能, 身辺処理機能)で調整し, それらの影響を除いた説明変数の目的変数への関連を把握する必要があるためである。また分析の際, 4つのモデルを設定したが, これは目的変数と説明変数の関連のみを単に評価するばかりでなく, 各調整要因の目的変数に対する影響の度合いをモデル別に確認することで, 介護予防マネジメントの評価項目選定への手がかりを得るためである。一方, 関連が強いと考えられる基準年の要介護状態と日常生活動作状況を別な変数として投入しているが, これは対象者の中には自宅での生活の中で日常生活動作に低下があり, 動作に困難を抱えながらも要介護状態(介護が必要)ではないと質問紙に回答する者, またその逆も考えられることから, 要介護状態と日常生活動作状況のずれが含まれていることを考慮し, 分析上両方で調整をとることでその影響を除いた結果の把握を意図している。これら検討の結果, 3年後の要介護状態と関連する社会関連性指標の項目は, <身近な社会参加>領域の「期待役割の遂行」, <社会への関心>領域の「社会貢献の可能性」であった。

「期待役割の遂行」は, 職業や家事, 地域活動など個人の身近な社会との関わりである。個人の役割意識は機能低下や生命予後に大きく影響する(Herzog et al., 1991; Hibbard et al., 1993)。また, 地域在宅高齢者

で職業または役割をもつ者が, 3年後の移動能力が向上する可能性があるとした報告がある(島田ら, 1997)。本研究においても地域や家庭で何らかの役割をもつ「期待役割の遂行」が3年後の機能の維持に有意に関連していた。

「社会貢献の可能性」は, 社会に何かしら役に立つと思うかどうかの個人的な意識である。このことは機会があれば自分の力を発揮できる場があると考えることにつながり, 自分自身を統制し, 新しいものに挑戦しようとする活動となる。これらの活動と生命予後との関連は, 自分が行動することにより望みどおりの状況をつくり出せると思えるようなcontrol感覚やmastery感覚として(Glass et al., 1995), 満足感や幸福感(well-being)につながるとした研究成果がある(Kaplan et al., 1996; Kujara et al., 1998)。本研究においても, 「社会貢献の可能性」という積極的に社会へ関心を向けていくことが, 3年後の機能の維持に有意に関連していた。

今回の分析の際, 調整変数として投入した年齢は, 説明変数の項目すべてで有意な関連がみられた。BaltesらやStrainらは, 高齢者個々の年齢に応じた活動の重要性を報告している(Baltes, 1997; Strain et al., 2002)。年齢に応じた活動への配慮の必要性が示唆された。また基準年の要介護状態および移動機能は3年後の要介護状態と強く関連しており, 予測因子と

しての重要性が示唆された。

一方、生活習慣では、3年後の要介護状態との関連は認められなかった。今後、縦断研究を継続し検証していく必要がある。

既存研究では、生命予後に影響を及ぼす要因として、社会との関わりや生活習慣の状況の他、年齢、性別、罹患、身体機能、社会経済的地位(最長職、収入等)、家族構成(配偶者や同居子の有無、同居家族等)等がある(Berkman et al., 1979; 片山ら, 1998; 武田, 2004)。本研究では、年齢、性別、罹患、身体機能を調整変数として投入するモデルを用い、社会経済的地位の最長職および収入、家族構成は除外して分析した。これは収入については調査実施上、把握が困難であったこと、また本調査対象者が農村在住者であり、ほぼ全数が農業に専業もしくは兼業に関わっており既婚同居で村内居住親族をもつことから、最長職や家族構成が交絡要因として影響することは少ないと考えたためである。さらに配偶者の有無については藤田ら(1990)の研究により、高齢者においては影響が少ないと報告されているため除外した。

今後さらに追跡調査を継続し、生命予後に対する影響要因、介護予防効果等、高齢者の生活の質(QOL)向上と健康寿命の延長実現に向けて分析を蓄積する必要がある。

V. 本研究の限界と今後の課題

本研究の限界としては、基準年に把握した社会関連性や生活習慣が追跡期間中も持続されていることを仮定して実施している点、ADL、要介護状態を主観的評価により把握し、訪問等により評価していない点である。今後、これらの限界性を補完する調査を実施する予定である。

VI. 結 論

社会関連性指標の項目のうち、「期待役割の遂行」および「社会貢献の可能性」が3年後の要介護状態に影響していることが明らかになった。このことは、地域在住高齢者の日常生活における社会との関わり状況が要介護状態に影響していることを示唆し、介護予防マネジメント等への活用が期待される。

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文 献

- 安梅勲江, 高山忠雄(1995): 社会関連性評価に関する保健福祉学的研究—地域に居住する高齢者の社会関連性指標の開発及びその妥当性—, 社会福祉学, 36(2), 59-73.
- 安梅勲江(1997): 高齢者の社会関連性評価と3年後の機能低下との関連性に関する保健福祉学的研究, 日本公衆衛生雑誌, 44(3), 159-166.
- Anne T. (2001): Retaining and Expanding Empowerment in the Transition to a Community-Oriented Support System: Japan in the 21st Century, Leonard F. Heumann, Empowering Frail Elderly People: Opportunities and Impediments in Housing, Health and Support Services Delivery, 65-80, Greenwood Publication, London.
- Baltes P. B. (1997): On the incomplete architecture of human ontogeny: Selection optimization, and compensation as foundation of developmental theory, *Am. Psychol.*, 52(4), 366-380.
- Berkman L. F., Syme S. L. (1979): Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents, *Am. J. Epidemiol.*, 109(2), 186-204.
- Breslow L. (1978): Risk factor intervention for health maintenance, *Science*, 200(4344), 908-912.
- Breslow L., Enstrom J. E. (1980): Persistence of health habits and their relationship to mortality, *Prev. Med.*, 9(4), 469-483.
- Breslow L., Breslow N. (1993): Health practices and disability: Some evidence from Alameda County, *Prev. Med.*, 22(1), 86-95.
- 藤田利治, 大塚俊男, 谷口幸一(1989): 老人の主観的幸福感とその関連要因, *社会老年学*, 29, 75-85.
- 藤田利治, 藤野脩一(1990): 地域老人の生命予後関連要因についての3地域追跡研究, *日本公衆衛生雑誌*, 37(1), 1-8.
- Glass T. A., Carlos M. L., Richard A. M., et al. (1999): Population based study of social and productive activities as predictors of survival among elderly Americans, *Br. Med. J.*, 319(21), 478-483.
- Glass T. A., Seeman T. E., Herzog A. R., et al. (1995): Change in productive activity in late adulthood: MacArthur Studies of Successful Aging, *J. Gerontol. Soc. Sci.*, 50(2), S 65-S 76.
- 権藤恭之, 古名丈人, 小林江里香, 他3名(2005): 超高齢期における身体的機能の低下と心理的適応, *老年社会科学*, 27(3), 327-338.
- 橋本修二, 岡本和土, 前田清(1986): 地域高齢者の生命予後に影響する日常生活上の諸因子についての検討3年6ヶ月の追跡調査, *日本公衆衛生雑誌*, 33(12), 741-748.

- 芳賀博, 柴田博, 松崎俊久(1988): 地域老人の日常生活動作能力に関する追跡的研究, 民族衛生, 54(5), 217-233.
- Herzog A. R., Franks M. M., Markus H. R., et al. (1998): Activities and well-being in older age: Effects of self-concept and educational attainment, Psychol. Aging, 13(2), 179-185.
- Herzog A. R., House J. S. (1991): Productive activities and aging well, Generations, 15, 49-54.
- Hibbard J. H., Pope C. R. (1993): The quality of social roles as predictors of morbidity and mortality, Soc. Sci. Med., 36(3), 217-225.
- Idler E. L., Russell L. B., Davis D. (2000): Survival, functional limitations, and self-rated health in the NHANES I epidemiologic follow-up study, 1992, Am. J. Epidemiol., 152(9), 874-883.
- 神宮純江, 江上裕子, 綱川直子, 他2名(2003): 在宅高齢者における生活機能に関する要因, 日本公衆衛生雑誌, 50(2), 92-105.
- Kaplan G. A., Strawbridge W. J., Cohen R. D., et al. (1996): Natural history of leisure-time physical activity and its correlates: Associations with mortality from all causes and cardiovascular disease over 28 years, Am. J. Epidemiol., 144(8), 793-797.
- 片山優子, 安梅勲江, 園田恭一, 他1名(1998): 地域在住高齢者の身体機能維持と趣味活動の関連に関する研究, 日本保健福祉学会誌, 5(1), 35-40.
- 加藤育子, 富永祐民, 松岡いづみ(1989): 生活習慣と主要成人病の関連の追跡調査, 日本公衆衛生雑誌, 36(9), 662-667.
- Koivumaa-Honkanen H., Honkanen R., Viinamaki H., et al. (2000): Self-reported life satisfaction and 20-year mortality in healthy Finnish adults, Am. J. Epidemiol., 152(10), 983-991.
- Kujala U. M., Kaprio J., Sarna S., et al. (1998): Relationship of leisure-time physical activity and mortality: The Finnish twin cohort, J. Am Med. Assoc., 279(6), 440-444.
- Lawton M. P., Winter L., Kleban M. H., et al. (1999): Affect and quality of life: Objective and subjective, J. Aging Health, 11(2), 169-198.
- Liu X., Liang J., Muramatsu N., et al. (1995): Transitions in functional status and active life expectancy among older people in Japan, J. Gerontol. B Psychol. Sci. Soc. Sci., 50(6), S 383-394.
- Mendes de Leon C. F., Gold D. T., Glass T. A., et al. (2001): Disability as a function of social networks and support in elderly African Americans and Whites: The Duke EPESE 1986-1992, J. Gerontol. Soc. Sci., 56 B, S 179-190.
- Menec V. H., Chipperfield J. G. (1997): Remaining active in later life: The role of locus of control in older adults' leisure activity participation, health, and life satisfaction, J. Aging Health, 9(1), 105-125.
- Rowe J. W., Kahn R. K. (1997): Successful aging, Gerontologist, 37(4), 433-441.
- Scarmeas N., Levy G., Tank M. X., et al. (2001): Influence of leisure activity on the incidence of Alzheimer's disease, Neurology, 57(12), 2236-2242.
- 島田千穂, 安梅勲江, 牛島廣治, 他1名(1997): 地域在宅高齢者の身体機能関連要因に関する保健福祉学的研究, 一心理社会的要因を中心とした縦断研究一, 日本保健福祉学会誌, 3(2), 77-88.
- 杉澤秀博(1993): 高齢者における主観的幸福感および受養に対する社会的支援の効果, 日常生活作業能力の相違における比較, 日本公衆衛生雑誌, 40, 171-180.
- 杉澤秀博, 中谷陽明, 前田大作, 他1名(1994): 高齢者における社会統合と日常生活動作能力の予後との関係, 日本公衆衛生雑誌, 41(10), 975-986.
- 杉澤あつ子, 杉澤秀博, 柴田博(1998): 地域高齢者の心身の健康維持に有効な生活習慣, 日本公衆衛生雑誌, 45(2), 104-111.
- Steinback U. (1992): Social networks, institutionalization, and mortality among elderly people in the United States, J. Gerontol., 47(4), S 183-190.
- Strain L. A., Grabusic C. C., Searle M. S., et al. (2002): Continuing and ceasing leisure activities in later life: A longitudinal study, Gerontologist, 42(2), 217-223.
- 総務省統計局(2006): 人口推計統計データ, 2006年12月25日, <http://www.stat.go.jp/data/jinsui/2002np/index.htm#05k3f-b>.
- 武田俊平(2004): 介護保険における65歳以上要介護認定者の2年後の生死と要介護度の変化, 日本公衆衛生雑誌, 51(3), 157-167.
- Tsuji I., Nishino Y., Tsubono Y., et al. (2004): Follow up and mortality profiles in the Miyagi Cohort Study, J. Epidemiol., 14 Suppl. I, S 2-6.
- Unger J. B., Johnson C. A., Marks G. (1997): Functional decline in the elderly: Evidence for direct and stress-buffering protective effects of social interactions and physical activity, Ann. Behav. Med., 19(2), 152-160.
- Unger J. B., McAvay G., Bruce M. L., et al. (1999): Variation in the impact of social network characteristics on physical functioning in elderly persons: MacArthur Studies of Successful Aging, J. Gerontol. B Psychol. Sci. Soc. Sci., 54(5), S 245-251.
- Verena H. M. (2003): The relation between everyday activities and successful aging: A 6-year longitudinal study, J. Gerontol. B Psychol. Sci. Soc. Sci., 58(2), S 74-82.
- Wilson R. S., Mendes de Leon C. F., Barnes L. L., et al. (2002): Participation in cognitively stimulating activities and risk of incident Alzheimer disease, J. Am. Med. Assoc., 287(6), 742-748.
- Wolinsky F. D., Johnson R. L., Stump T. E. (1995): The risk of mortality among older adults over an eight-year period, Gerontologist, 35(2), 150-162.

**SOCIAL INTERACTION AND LONGEVITY: AN
ELEVEN-YEAR LONGITUDINAL STUDY OF OLDER
PERSONS IN A JAPANESE VILLAGE**

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ABSTRACT

Many studies around the world have demonstrated the relationship between various dimensions of social interaction and outcomes related to morbidity and mortality among older adults. The current study examines these relationships between social participation and morbidity and mortality in a Japanese sample across an eleven year period. Results demonstrate that greater dependence in mobility, sensory, and activities of daily living were negatively related to survival over 11 years. The overall analysis revealed that most indicators of social interaction were positively related to survival. And, even after controlling for the effects of age, gender, disease, moving function, sensory function, and ADL function, many types of social activities were significantly related to survival. Overall, the relationship between social integration, in a wide variety of ways it can be measured, has a complex, but crucial role in increasing not just the length, but the quality of the lives of older people.

Key Words: social interaction, longevity, Japanese elders

INTRODUCTION

As life expectancy increases around the world, individuals and societies alike are re-imagining what life in later years can be like, and research investigating various factors that contribute to both longevity and quality of life has proliferated over the past few decades. Many studies around the world over the past 20 years have demonstrated the relationship between various dimensions of social networks, social support, and social interaction, and outcomes related to morbidity, physical and mental deterioration, and mortality among older adults (Anme, 1997a, 1997b; Antonucci, Lansford, Akiyama, Smith, Baltes, Takahashi et al., 2002; Antonucci, Okorodudu, & Akiyama, 2002; Berkman & Breslow, 1983; Berkman & Syme, 1983; Cheng & Chen, 2006; Haga, 1988; Kempen, Ranchor, van Sonderen, van Jaarsveld, & Sanderman, 2006; McAuley, Elavsky, Motl, Konopack, Hu, & Marqueze, 2005; Sugisawa, Liang, & Liu, 1994; Wallston, Alagna, DeVellis, & DeVellis, 1983). Across these studies, distinct components of social relationships have been examined, but with generally uniform results indicating the greater amount of social support and/or interaction (especially when positive), the greater is the physical and mental health, and thus, the longevity, of older persons.

Some research has focused primarily on the *breadth* of social networks, while others have posited that the *quality or depth* of social networks is the key to the positive impact they have on physical and mental health (Fiori, Antonucci, & Cortina, 2006). Others have proposed that having multiple roles in one's life is what increases one's sense of integration into one's community or society, and that the outcome of such integration, as Maslow theorized many years ago, is improved mental health and the ability to contribute in a positive way to one's community and develop as an individual (Coughlin & Lau, 2006; Hibbard & Pope 1993; Moen, 2001, compare Fiori, Antonucci, & Cortina, 2006). Thus, either the *breadth*—how many roles or how many ways a person is integrated into a rich network—as well as the *depth*—the quality of the relationships—are keys to more positive mental and physical health.

Other researchers have looked more broadly at the concept of "social participation." Sugisawa, Liang, & Liu (1994) defined 'social participation' as "an active involvement in society and embeddedness in a social system, a way of life that is characterized by social competence and active social interaction in general." In a 3-year longitudinal study in Japan they found a direct effect of social participation on mortality (68% chance of dying for those with social participation vs. those with no participation). Social participation and its relationship to mortality have also been found in the United States (Berkman & Brestow, 1983; Berkman & Syme, 1979; House, Robbins, & Metzner, 1982) and some European countries, for example, Sweden (Hanson et al., 1989), France (Grand, Grosclaude, Bocquet, Pous, & Albaredez, 1990) and Finland (Jylha & Aro, 1989). In the United States recently, "civic engagement" has become a common term used to describe a variety of types of social participation, which may range from political participation and civic volunteerism to staying informed through media or other means,

care-giving, and informal connections with people such as storekeepers, and so on (Martinson & Minkler, 2006).

Such a relationship may be complicated by the particular circumstances in which an older person is living. For example, Wong, Yoo, & Stewart (2006) found that older Chinese and Korean elders living in the United States reported changing their lifelong expectation of filial piety (sense of obligation) from their children, and for some, they find themselves unprepared for dealing with aging in a more solitary way. One of the key cultural differences between many Asian countries and the United States is that while parents may have sacrificed for their children at home in their native country, the children may now be more "westernized" and not feel the complementary sense of obligation. In addition, because there are not financial consequences (e.g., inheritances) tied to such filial piety, adult children in the United States may not feel the same pressures. However, even in many Asian countries, though, with the major increase in women employed outside the home, the traditional family dynamic of, for example, a daughter-in-law caring for older parents, is shifting away from the model that older persons have grown up with and expected. Thus, even in their own families, whether in their native country or in the United States, older persons may experience isolation due to the lack of either physical and/or emotional proximity.

These findings support the conclusion of Sugisawa and colleagues (1994) who concluded that "Examining the linkages between social relations and mortality within diverse sociocultural settings is critical in testing the robustness of the observed effects of networks and support. Consistent replications of certain observations under vastly different conditions will reinforce their validity." Their 3-year longitudinal study of older Japanese found a direct, though inverse, effect of social participation on mortality. Such results can assist both direct service providers, and policymakers, with important information about how to promote and extend not just quantity of years of life, but almost more importantly, quality of life.

Previous research by some of the authors in the same community examined in the present study found similar results. Specifically, when following a community sample of approximately 1,000 older persons, over a five-year period, a newly developed measure of social interaction (the ISI—described in the Method section) was significantly and positively related to longevity, even after controlling for age, sex, education, and health status (Anme, 1995; Anme & Chiho, 2000). In a follow-up study of seven years, it was found that:

- 1) baseline age and physical function were related to the seven-year mortality;
- 2) greater social interaction was positively related to reduced mortality;
- 3) multiple logistic regression analysis adjusted for baseline age, gender, physical function, health status, and ADL indicated that greater social interaction was related to reduced mortality (Anme, Shinohara, Sugisawa, & Ito, 2006).

The current study examines these relationships between social participation and morbidity and mortality in some of this same Japanese sample, across an eleven year period, hypothesizing that the greater the degree of social participation, as measured by the Index of Social Interaction (ISI), the lower the mortality rates among older people.

METHOD

Participants

Tobishima is a typical farming community in a suburban area of Japan, with a population of 4,625. Beginning in 1991, *The Tobishima Study* sought to investigate factors associated with longevity in elders, with the goal of creating a health-promoting program that would maximize quantity and quality of life for residents. All of the residents were invited to participate, with informed consent, and all agreed. Of the sample in 1994, the 730 persons aged 60 or older were included in analyses that looked at 11-year mortality rates in 2005. Of those 730 persons, 655 were actually answered, for a response rate of 89.7%. There were no significant gender or age differences between the participants and non-participants. At the end of the eleven year period, 237 persons were deceased. Of these, 225 passed away from natural causes or identifiable diseases, 8 were by accident, and 4 were unknown. Only those 225 who were deceased due to natural or disease causes were included in the analyses here.

Measures

Independent Variables

Three types of independent variables were examined: socio-demographics, disability and health status, and social interactions. The sociodemographics include age and gender. [Income and education were not reported because two factors were at work here: a) people are very reluctant to report specific income and education, and b) the homogeneity of financial and educational status in this community meant income and education would not have had great variability anyway in this sample. Marital status was also not recorded due to the fact that whether people were married or single, all elders in this community lived with family members, including children. Fujita and Hatano (1990) has concluded that in this set of living circumstances, marital status is relatively unimportant.] The disability and health conditions measures included mobility, sensory function (vision or auditory impairment), activities of daily living, and disease status (either with none or with any number of diseases, such as diabetes, high blood pressure, and heart disease).

Social interaction was measured using the "Index of Social Interaction" (ISI). This scale was developed in Japan by one of the authors (Anme, 1992) for evaluating social interactions of various types and includes 18 items. Factor analysis revealed five subscales:

- 1) Independence, which includes having a motivation to live an active lifestyle, taking an active approach toward one's life, being motivated to live a healthy life, and having a regular or routine lifestyle;
- 2) Social curiosity, which comprised reading newspapers, reading books, trying to use new equipment, having a hobby, and having a feeling of importance;
- 3) Interaction, composed of communication within the family, communication with non-family persons, and interactions with non-family persons;
- 4) Participation in society, made up of participation in social groups, participation in neighborhood affairs, watching television and having an active role in society; and
- 5) Feelings of safety, meaning having counsel, and having someone to give support in an emergency (see Table 1). Cronbach's alpha for the subscales ranged from .78-.81.

Total or subscale scores were calculated by adding each item's score rated one point for positive response or zero points for negative response. The mean score of the rest of the items at analysis replaced missing values of items in "Index of Social Interaction." We defined low social interaction as infrequent in-person social contacts (no face-to-face contact, in a typical work place, with families, neighbors, friends, or relatives) and losing interest in social activities (no social role, ignore social circumstances).

Dependent Variable

The dependent variable was simply whether a person was still alive or not at the 11-year follow up time.

Analysis Plan

Four models were tested to determine the strength of the relationship of social interaction to longevity. These models varied according to the variables controlled in each analysis. First, the relationship between the sociodemographic variables and mortality was analyzed. Second, the relationship between health status and functional level, and mortality were analyzed. Third, the relationship between the ISI score and mortality was examined, broken down by age and gender. Finally, a logistic regression analysis was performed to predict mortality from the ISI score, controlling for age, gender, education, health status, mobility, sensory function, and activities of daily living. All analyses were conducted using the PC-SAS program.

RESULTS

Demographics and Mortality

Table 2 displays the results of the analysis of the sociodemographic variables and mortality rates. Mortality was significantly higher among persons over 75 years of age (63.5%) versus those under 75 (17.1%) ($p < .01$). Mortality

Table 1. Index of Social Interaction (ISI)

| | |
|---|---|
| 1. Independence | |
| Motivation to live an active lifestyle | "Do you have motivation to live an active lifestyle?" |
| Taking an active approach | "Do you take an active approach towards your life?" |
| Being motivated to live a healthy life | "Are you motivated to live a healthy life?" |
| Having a regular lifestyle | "Do you have a regular or routine lifestyle?" |
| 2. Social curiosity | |
| Reading newspapers | "Do you read newspapers regularly?" |
| Reading books | "Do you read books or magazines regularly?" |
| Try to use new equipment | "Do you try to use new equipment like a video cassette player?" |
| Having a hobby | "Do you have any hobbies?" |
| Feeling of importance | "Do you have feeling of importance in the society?" |
| 3. Interaction | |
| Communication within the family | "Do you often communicate with your family members?" |
| Communication with non-family persons | "Do you communicate with non-family persons regularly?" |
| Interaction with non-family persons | "Do you interact with non-family persons regularly?" |
| 4. Participation in the society | |
| Participation in social groups | "Do you have the chance to participate in social groups?" |
| Participation in neighborhood affairs | "Do you have the chance to participate in your neighborhood affairs?" |
| Watching television | "Do you watch television?" |
| Having an active role in society | "Do you have an active role in society or social affairs?" |
| 5. Feeling of safety | |
| Having counsel | "Do you have someone who gives you counsel in difficult situations?" |
| Having someone to give support in emergency | "Do you have someone to support you in emergencies?" |

Table 2. Demographic Background and Mortality ($n = 624$)

| Item | Category | Total | | Decrease | | Survive | | p |
|------------------|-------------|-------|------|----------|------|---------|------|-----|
| | | N | % | N | % | N | % | |
| Age | <75 | 369 | 59.1 | 63 | 17.1 | 306 | 82.9 | *** |
| | 74> | 255 | 40.9 | 162 | 63.5 | 93 | 36.5 | |
| Gender | Male | 265 | 42.5 | 103 | 38.9 | 162 | 61.1 | |
| | Female | 359 | 57.5 | 122 | 34.0 | 237 | 66.0 | |
| Disease | Yes | 226 | 36.2 | 88 | 38.9 | 138 | 61.1 | |
| | No | 398 | 63.8 | 137 | 34.4 | 261 | 65.8 | |
| Mobility | Dependent | 148 | 23.7 | 87 | 58.8 | 61 | 41.2 | *** |
| | Independent | 476 | 76.3 | 138 | 29.0 | 338 | 71.0 | |
| Sensory function | Dependent | 278 | 44.6 | 121 | 43.5 | 157 | 56.5 | ** |
| | Independent | 346 | 55.4 | 104 | 30.1 | 242 | 69.9 | |
| ADL function | Dependent | 79 | 12.7 | 43 | 54.4 | 36 | 45.6 | ** |
| | Independent | 545 | 87.3 | 182 | 33.4 | 363 | 66.6 | |

*** $p < 0.001$, ** $p \leq 0.001$, $p < 0.01$

rates were not significantly different for women (34.0%) and men (38.9%), or for those with disease (38.9% for those with disease compared to 34.4% for those without disease).

Functionality, Health, and Mortality

Mortality was significantly higher among persons with mobility dependence (58.8%) than those who were independent in terms of mobility (29.0%). Also mortality was significantly higher among persons with sensory dependence (43.5%) than those who were independent in terms of sensory (30.1%). Those with greater dependence in terms of activities of daily living also had significantly higher mortality rates (54.4%) than those who were independent (33.4%).

Social Interaction and Mortality

An analysis of each item on the ISI, as shown in Table 3, revealed the following: the *lack* of the following items were each significantly related to mortality: "motivation to live an active lifestyle" ($p = .001$), "taking an active approach toward life" ($p = .001$), "being motivated to live a healthy life" ($p = .001$), "having regular life style" ($p = .001$), "reading newspapers" ($p = .001$), "reading books" ($p = .001$), "trying to use new equipment" ($p = .001$), "having a hobby" ($p = .001$), "feeling of importance" ($p = .01$), "communication within the family" ($p = .05$), "communication with non-family" ($p = .01$), "participation in neighborhood affairs" ($p = .01$), "interaction with non-family" ($p = .05$) and "having an active social role" ($p = .001$).

Multidimensional Analysis of ISI and Mortality

Using logistical regression, an analysis was done to predict mortality after 11 years from the ISI score, after controlling for age, gender, education, health status,

Table 3. Social Interaction and Mortality After 11 Years ($n = 624$)

| Item | Category | Total | | Decrease | | Survive | | p |
|--|----------|-------|------|----------|------|---------|------|-----|
| | | N | % | N | % | N | % | |
| Motivation to live an active lifestyle | - | 96 | 15.4 | 56 | 58.3 | 40 | 41.7 | *** |
| | + | 528 | 84.6 | 169 | 32.0 | 359 | 68.0 | |
| Taking an active approach | - | 116 | 18.6 | 61 | 52.6 | 55 | 47.4 | *** |
| | + | 508 | 81.4 | 164 | 32.3 | 344 | 67.7 | |
| Being motivated to live a healthy life | - | 80 | 12.8 | 45 | 56.2 | 35 | 43.8 | *** |
| | + | 544 | 87.2 | 180 | 33.1 | 364 | 66.9 | |
| Having regular lifestyle | - | 78 | 12.5 | 48 | 61.5 | 30 | 38.5 | *** |
| | + | 546 | 87.5 | 177 | 32.4 | 369 | 67.6 | |
| Reading newspapers | - | 182 | 29.2 | 89 | 48.9 | 93 | 51.1 | *** |
| | + | 442 | 70.8 | 136 | 30.8 | 306 | 69.2 | |
| Reading books | - | 369 | 59.1 | 158 | 42.8 | 211 | 57.2 | *** |
| | + | 255 | 40.9 | 67 | 26.3 | 188 | 73.7 | |
| Trying to use new equipment | - | 362 | 58.0 | 163 | 45.0 | 199 | 55.0 | *** |
| | + | 262 | 42.0 | 62 | 23.7 | 200 | 76.3 | |
| Having a hobby | - | 197 | 31.8 | 102 | 51.8 | 95 | 48.2 | *** |
| | + | 427 | 68.4 | 123 | 28.8 | 304 | 71.2 | |
| Feeling of importance | - | 234 | 37.5 | 102 | 43.6 | 132 | 56.4 | ** |
| | + | 390 | 62.5 | 123 | 31.5 | 267 | 68.5 | |
| Communication within the family | - | 77 | 12.3 | 36 | 46.8 | 41 | 53.2 | * |
| | + | 547 | 87.7 | 189 | 34.6 | 358 | 65.4 | |
| Communication with non-family | - | 104 | 16.7 | 53 | 51.0 | 51 | 49.0 | ** |
| | + | 520 | 83.3 | 172 | 33.1 | 348 | 66.9 | |
| Participation in social groups | - | 234 | 37.5 | 98 | 41.9 | 136 | 58.1 | * |
| | + | 390 | 62.5 | 127 | 32.6 | 263 | 67.4 | |
| Participation in neighborhood affairs | - | 104 | 16.7 | 51 | 49.0 | 53 | 51.0 | ** |
| | + | 520 | 83.3 | 174 | 33.5 | 346 | 66.5 | |
| Having an active role in society | - | 151 | 24.2 | 80 | 53.0 | 71 | 47.0 | *** |
| | + | 473 | 75.8 | 145 | 30.7 | 328 | 69.3 | |

*** $p < 0.001$, ** $p \leq 0.001$, * $p < 0.01$, $p < 0.05$

mobility and sensory function, and independence in terms of activities of daily living. Tables 4 through 7 show the results of this analysis. "Lack of having regular lifestyle" (odds 2.37), "being motivated to live a healthy life" (odds 1.87), "having a hobby" (odds 1.72), and "trying to use new equipment" (odds 1.59) were all significantly related to mortality after controlling for the effects of age, gender, disease, moving function, sensory function, and ADL function.

DISCUSSION

This study has several strengths. First, the response rate and ability to follow a sizable proportion (90%) of a specific community allows for greater insight into the long-term relationship between social interaction and participation, and mortality. The data, which were collected through both survey and interview methods,

Table 4. Odds for Mortality by Social Interaction and Controlled Factors

| Item | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|---------------------------|---------|-----------|----------|-------------|----------|-------------|-------------|-------------|-------------|-------------|-----------|-------------|-----------|----------------|
| | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range |
| Having regular life style | 3.35*** | 2.04-5.45 | 2.50** | 1.46-4.65 | 2.46** | 1.36-4.44 | 2.49** | 1.38-4.50 | 2.34** | 1.28-4.26 | 2.40** | 1.31-4.39 | 2.37** | 1.27-4.41 |
| Age | | | 1.19*** | 1.16-1.23 | 1.24*** | 1.17-1.24 | 1.20** | 1.16-1.24 | 1.19** | 1.15-1.23 | 1.20** | 1.16-1.24 | 1.16-1.24 | 1.16-1.24 |
| Gender | | | 1.30** | 1.27-2.34 * | 1.30** | 1.27-2.34 * | 1.28-2.88 * | 1.33-3.02 * | 1.28-2.88 * | 1.33-3.02 * | 1.34-3.05 | 1.34-3.05 | 1.20** | 1.34-3.05 |
| Disease | | | | | 1.92** | 0.80-1.79 | 2.00** | 0.82-1.86 | 2.02** | 0.81-1.84 * | 2.02** | 0.81-1.84 * | 2.02** | 0.81-1.84 * |
| Mobility | | | | | 1.20 | 1.30-3.26 | 1.22 | 1.36-3.26 | 1.22 | 1.30-3.26 | 1.22 | 1.36-3.26 | 2.02** | 1.30-3.70 |
| Sensory function | | | | | 2.06** | | | | 2.06** | | 2.23** | 0.53-1.25 | 1.22 | 0.53-1.25 |
| ADL function | | | | | | | | | | | 0.61 | | 2.19** | 0.81 0.54-2.06 |
| Intercept | -0.7346 | | -13.7946 | | -14.7853 | | -14.8130 | | -14.3356 | | -14.4578 | | -14.4614 | |
| H-L Test | — | | 0.2878 | | 0.5911 | | 0.6498 | | 0.6677 | | 0.4380 | | 0.5044 | |

***p < 0.001, **p ≤ 0.001, *p < 0.01

Table 5. Odds for Mortality by Social Interaction and Controlled Factors

| Item | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|--|---------|-----------|----------|------------|----------|-----------|----------|------------|----------|-----------|----------|------------|----------|-----------|
| | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range |
| Being motivated to live a healthy life | 2.60*** | 1.61-4.19 | 2.00* | 1.15-3.50 | 1.98* | 1.11-3.46 | 1.99* | 1.13-3.51 | 1.84* | 1.04-3.26 | 1.91* | 1.07-3.41 | 1.87* | 1.02-3.41 |
| Age | | | 1.19*** | 1.16-1.23 | 1.20*** | 1.17-1.24 | 1.20** | 1.17-1.24 | 1.19*** | 1.15-1.23 | 1.20** | 1.16-1.24 | 1.20** | 1.16-1.24 |
| Gender | | | 1.98** | 1.31-2.93* | 1.98** | 1.32-2.87 | 2.06** | 1.37-3.10* | 1.98** | 1.32-2.87 | 2.06** | 1.36-3.13* | 1.98** | 1.36-3.14 |
| Disease | | | | | 1.20 | 0.80-1.79 | 1.23 | 0.82-1.85 | 2.08** | 1.30-3.26 | 2.23** | 1.37-3.64 | 2.23** | 1.37-3.68 |
| Mobility | | | | | | | | | | | | | | |
| Sensory function | | | | | | | | | | | | | | |
| ADL function | | | | | | | | | | | | | | |
| Intercept | -0.7042 | | -13.8085 | | -14.8267 | | -14.8693 | | -14.3732 | | -14.4614 | | -14.4681 | |
| H-L Test | — | | 0.0566 | | 0.8668 | | 0.8780 | | 0.6640 | | 0.7974 | | 0.8240 | |

*** $p < 0.001$, ** $p \leq 0.001$, * $p < 0.01$, $p < 0.05$

Table 6. Odds for Mortality by Social Interaction and Controlled Factors

| Item | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|------------------|---------|-----------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-----------|
| | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range |
| Having a hobby | 2.65*** | 1.87-3.76 | 1.72** | 1.14-2.58 | 1.88** | 1.24-2.85 | 1.92** | 1.26-2.81 | 1.70* | 1.11-2.62 | 1.74* | 1.13-2.67 | 1.72* | 1.12-2.85 |
| Age | | 1.19*** | 1.15-1.23 | 1.20*** | 1.16-1.24 | 1.20** | 1.16-1.24 | 1.19** | 1.15-1.23 | 1.19** | 1.15-1.23 | 1.19** | 1.15-1.23 | |
| Gender | | | 2.12** | 1.41-3.18 * | | 1.43-3.24 * | | 1.46-3.32 * | | 1.48-3.37 * | | 1.48-3.37 * | | 1.48-3.37 |
| Disease | | | | | 2.15** | 0.82-1.85 | 2.20** | 0.83-1.88 | 2.23** | 0.83-1.87 | 2.23** | 0.83-1.87 | 2.23** | 0.83-1.88 |
| Mobility | | | | | 1.23 | | 1.25 | 1.21-3.07 | 1.24 | 1.27-3.42 | 1.25 | 1.15-3.32 | 1.25 | 1.15-3.32 |
| Sensory function | | | | | | | 1.93** | | | | 2.08** | 0.53-1.25 | 1.96* | 0.52-1.24 |
| ADL function | | | | | | | | | | | 0.81 | | 0.80 | 0.65-2.39 |
| Intercept | -0.8048 | | -13.5747 | | -14.6210 | | -14.6575 | | -14.2620 | | -14.3668 | | -14.3859 | |
| H-L Test | — | | 0.0837 | | 0.3398 | | 0.0707 | | 0.2965 | | 0.2704 | | 0.3832 | |

***p < 0.001, **p ≤ 0.001, *p < 0.01, p < 0.05

Table 7. Odds for Mortality by Social Interaction and Controlled Factors

| Item | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|-----------------------------|---------|-----------|----------|-----------|----------|-----------|----------|-----------|---------|-----------|----------|-----------|----------|-----------|
| | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range | Odds | Range |
| Trying to use new equipment | 2.64*** | 1.88-3.76 | 1.51** | 1.00-2.27 | 1.69* | 1.11-2.56 | 1.68* | 1.11-2.55 | 1.58* | 1.03-2.41 | 1.61* | 1.05-2.46 | 1.59* | 1.04-2.44 |
| Age | | | 1.19*** | 1.15-1.23 | 1.20*** | 1.16-1.24 | 1.20** | 1.16-1.24 | 1.19** | 1.15-1.23 | 1.19** | 1.15-1.23 | 1.19** | 1.15-1.23 |
| Gender | | | 2.13** | 1.42-3.20 | 2.16** | 1.43-3.24 | 2.16** | 1.43-3.24 | 2.22** | 1.47-3.36 | 2.25** | 1.49-3.41 | 2.25** | 1.49-3.41 |
| Disease | | | | | 1.15 | | 1.15 | | 1.19 | | 1.19 | | 1.19 | |
| Mobility | | | | | | | | | 2.05** | | 2.05** | | 2.05** | |
| Sensory function | | | | | | | | | | | | | | |
| ADL function | | | | | | | | | | | | | | |
| Intercept | -1.1712 | | -13.6544 | | -14.7117 | | -14.7492 | | -14.267 | | -14.3775 | | -14.3904 | |
| H-L Test | — | | 0.2229 | | 0.2926 | | 0.2673 | | 0.1595 | | 0.1145 | | 0.2592 | |

*** $p < 0.001$, ** $p \leq 0.001$, * $p < 0.01$, $p < 0.05$

as well as from health center records (for mortality), were highly reliable. Also, given the stability of the community, dropout rates were negligible (only 16 persons moved from the community during the 11-year period). In addition, the construct of social interaction was measured in a multidimensional manner, with five subscales on the Index of Social Interaction (ISI), providing a rich picture of various dimensions of social interactions, and capturing the dynamic nature of an older person's daily life.

The limitations of this study are that there was only one community studied, and there is an unanswered question as to whether 11 years is an adequate length of time to accurately assess the relationship of social interaction to mortality. Two measurement limitations of this study also should be acknowledged at this point. The first one pertains to the social interaction index. Participants were simply asked whether they participated in each of the social interactions. There was no assessment of the frequency of the activity, nor of the time spent on each activity. Important questions as to whether the frequency of activity participation and duration make a difference can therefore not be answered. Similarly, the social interaction scale occasionally combines several activities into one item, making it impossible to examine the effect of each activity listed. Each of which might have potentially different consequences. Teasing apart such specific effects is an important task for future research and will require more detailed assessment of activity participation.

While there were unsurprising overall age differences found in 11-year mortality rates, with those over 75 having higher mortality rates (mirroring the results found by Sugisawa et al. (1994)), the simple gender analysis did not reveal the gender differences that tend to be found in mortality rates. However, the logistical regression analysis did show that men were at higher risk for mortality than women, a result typically found around the world. Similarly, as one might expect, those respondents with higher levels of mobility dependence, and ADL dependence were at higher risk for 11-year mortality.

The results of this study for this sample did clearly demonstrate a positive relationship between social interaction, as measured by the ISI, and mortality over a 11-year period. These results are consistent with those of Yasuda and Ohara (1989; compare Sugisawa, 1994) who found that social networks predicted mortality over five years among a sample of rural 65-74 year old men and 75+ women and Sugisawa et al. (1994) who also found that quantity and quality of networks were significantly related to morbidity and mortality in Japanese elders. In addition, Antonucci et al. (2002) found that Japanese women with greater resource deficits and negative social relationships had higher depression than those with less negative relationships and fewer resource deficits. These findings may also support Cheng and Chen's (2006) hypothesis that if women value relatedness more than men, then the impact of relationships may have different effects on them. Similarly, Neff and Hartner (2002; cited from Reitzes & Mutran, 2006) posit that women and men may focus on different roles and social support to maintain and enhance their self-concepts.

Some of the main factors for predicting mortality were reading books, having an active role, and having a feeling of importance. While it may not be that having an active role translates specifically into participation in social networks or neighborhood affairs, it seems that the need to feel active, engaged, informed, and important, which are all fundamental human needs at any age, may be even more important in late life, providing a motivation to live. Thus, practitioners who want to assist older persons in establishing and maintaining active roles may need to spend some time clarifying what that means for each person.

Interestingly, however, the multidimensional analysis showed that level of effects revealed by the odds ratio of social interaction dropped out as a significant predictor of 11-year mortality when items were allowed to interact with one another. This seems to indicate a more complex model of the role of social interaction in mortality and may illustrate one of the many models that have been proposed to explain the varied relationships that have been found across time and in various countries around the world. For example, Cheng and Chen (2006) proposed three models of the relationship between social participation, social relationships, and health. The first posits that health allows one to socially participate and thus establish and/or maintain one's interpersonal relationships, with the outcome being increased life satisfaction. A second model is that health directly leads to both social participation *and* interpersonal relationships. The third model is that there is a reciprocal effect between health and participation and relationships that all feed back on one another in a positive manner.

Similarly, Sugisawa et al. (1994) found that social participation affected mortality through self-rated health, but NOT chronic diseases or functional health. Most variables had indirect effects on mortality through the factor of self-rated health. They also found that, contrary to western countries, social participation had a small, though statistically significant effect on life satisfaction after controlling for other factors. However, interpersonal relationships also had a major indirect effect on life satisfaction through health, suggesting that people are more able to stay healthy when embedded in a social network. Overall, then, it seems that the relationship between social integration, in a wide variety of ways it can be measured, has a complex, but crucial role in increasing not just the length, but the quality of the lives of older people.

CONCLUSION

As McAuley and colleagues noted in 2005, "living well in concert with living longer is an important public health goal in our society. . . ." Understanding the role that various forms of social integration and interaction play in prolonging life with quality is important, and acknowledging the importance of cultural and social context for that role is crucial. This study of older persons in one community in

Japan clearly demonstrates the centrality of social participation in longevity that comes from having an active role and a feeling of importance in one's life. These results clearly come down on the activity side of the long-lived debate between the "activity theory" and the "disengagement theory" of aging. And, as noted in the 2002 U.N. World Assembly on Aging the theme was "Towards a Society for All Ages" because people do not age alone, but rather in families, communities, and countries; it is imperative that researchers and practitioners study elders in these contexts, and across time, in order to enhance their lives. Further research in various communities and countries can help further clarify the complex relationship between various types of social interactions and their relationship to the quantity and quality of life for older persons.

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REFERENCES

- Anme, T. (1992). Study to develop "Index of Social Interaction." *Journal of National Rehabilitation Center for the Disabled*, 13, 1-7.
- Anme, T. (1995). Index of social interaction and physical deterioration. *Japanese Social Welfare*, 3, 59-73.
- Anme, T. (1997a). A health-social study for developing the evaluation of environmental stimulation and the relation of physical deterioration after three years. *Systems Sciences for Health and Social Services for the Elderly and Disabled*, 6, 349-353.
- Anme, T. (1997b). Evaluation of environmental stimulation and its relation to physical deterioration in the elderly after 3 years: A health-social longitudinal study. *Japanese Journal of Public Health*, 44, 159-166.
- Anme, T., & Chiho, S. (2000). Social interaction and mortality: A five-year longitudinal study of elderly people. *Japanese Journal of Public Health*, 47(2), 127-133.
- Anme, T., Shinohara, R., Sugisawa, Y., & Ito, S. (2006). Social interaction and mortality: A seven-year longitudinal study of elderly people. *Japanese Journal of Public Health*; 53(9), 681-687.
- Antonucci, T. C., Okorodudu, C., & Akiyama, H. (2002). Well-being among older adults on different continents. *Journal of Social Issues*, 58(4), 617-626.
- Antonucci, T. C., Lansford, J. E., Akiyama, H., Smith, J., Baltes, M. M., Takahashi, K., Fuhrer, R., & Dartigues, J. F. (2002). Differences between men and women in social relations, resource deficits, and depressive symptomatology during later life in 4 nations. *Journal of Social Issues*, 58(4), 767-783.
- Berkman, L. F., & Breslow, L. (1983). *Health and ways of living: The Alameda County study*. New York: Oxford University Press.