

Ian Duncan Curriculum Vitae

*Adj. Assoc. Professor of Actuarial Statistics, Dept. of Statistics & Applied Probability,
University of California Santa Barbara.*

President, Santa Barbara Actuaries Inc.

EDUCATION

B.A. (Mathematics) Natal University (1972)

B. Phil. (Economics) Balliol College, Oxford (1976)

Ph.D. Candidate, Heriot-Watt University, Edinburgh (2014-)

PROFESSIONAL AFFILIATIONS

Fellow of the Institute of Actuaries (London) (1982)

Fellow of the Canadian Institute of Actuaries (1984)

Fellow, Life Office Management Institute (1985)

Fellow, Society of Actuaries (2002)

Fellow, Conference of Consulting Actuaries (2015)

Member of the American Academy of Actuaries (1992)

EXPERIENCE

Summary: Thirty-five years of experience in the healthcare field; healthcare consultant to large health insurance payer clients for 30 years. Founder and president of three healthcare analytics companies, developer of healthcare analytics software products and manager of care management programs. Vice President responsible for Research and Actuarial Functions (Clinical Outcomes and Reporting) at Walgreens 2010-4. Led actuarial work, modeling and reporting for Walgreens ACO initiative (MSSP) and Walgreens worksite Clinic business. Consulting Chief Actuary and Board Member for New York-based start-up health insurer. Five years of experience in the Management Consulting Services practice of Price Waterhouse and PwC, leading large systems implementation, strategy and process improvement projects in the health insurance industry, focused on improving financial reporting, planning and underwriting systems and processes. Director responsible for the claims audit practice, Price Waterhouse LLP. Santa Barbara Actuaries consulting clients include Johnson & Johnson, SSDC Systems, Glytec Inc., Centene Corporation, Enclara Pharmacia, US Oncology and Consumer Medical Inc. Substantial research background as adjunct research professor (Georgetown University, 2007- 15) and Adjunct Professor in the department of Statistics at the University of California, Santa Barbara (2011-). Author of three books, numerous peer-reviewed papers and book chapters on health outcomes, predictive modeling and risk adjustment.

Mr. Duncan has been a leader in the both the Disease Management industry and the actuarial profession through research, publications (including the *Dictionary of Disease Management Terminology, Managing and Evaluating Healthcare Intervention Programs, (2008; 2nd edition January 2014)*) and *Healthcare Risk Adjustment and Predictive Modeling*

(2011; 2nd ed. early 2018) and public speaking. As a board member of the Commonwealth of Massachusetts Health Insurance Connector Authority (2007-14), contributed to the design and implementation of healthcare reform in Massachusetts and served as a bridge between the insurance industry and regulators responsible for reform. Author of a study of Massachusetts reform sponsored by Commonwealth Fund and Society of Actuaries (published in 2016).

PROFESSIONAL AND BUSINESS HISTORY

President, Santa Barbara Actuaries Inc. 2011-. Start-up actuarial consulting firm providing data analytics, predictive modeling, strategy consulting and expert opinion.

Adjunct Professor, Dept. of Statistics & Applied Probability, University of California, Santa Barbara 2011- . Teaching courses in actuarial statistics and mathematical finance, and leading the graduate seminar in actuarial research.

Vice President, Walgreen Co. 2010 - 4. Responsible for establishing the Clinical Research function at Walgreens, integrating analysts from a former reporting area and hiring new management. Developed and directed policies to address Business Unit needs, trained and mentored staff, and published approximately fifteen peer-reviewed papers per year on topics ranging from retail pharmacy, specialty pharmacy, immunizations, HIV, infusion and Value-based benefits. Led the analytics, predictive modeling, reporting and risk management needs of Walgreens ACO initiatives and employer worksite business unit as it moved from cost-plus to risk-taking contracts. Staff managed: 65.

President: Solucia Inc. (Founded 1998; full-time 2003-10). Primary practice in the area of Healthcare Analytics, Predictive Modeling, Health Risk Management and Care Management evaluation. Clients include health plans, Disease Management companies, Provider Groups, TPAs, State Medicaid agencies, Medicaid MCOs and employers. Solucia provided analytics and reporting services for a large number of Blue Cross Blue Shield plans and several care management companies. Worked with clients to develop a value-based benefits product to incent members to use high-quality, low-cost services. Consulting Chief Actuary and Board member of the Freelancers Insurance Co., a start-up New York health insurer. Responsible for pricing, product development and operational support.

Based on Solucia's consulting practice developed three Software products used by healthcare companies: Opportunity Analysis, program optimization, Predictive Modeling, care management workflow, and care management outcomes evaluation. Now called SCIOVantage, the products are used by TPAs, health plans and providers. Total staff: 35.

Landacorp, Inc.: Consulting and Analytics Group, General Manager (2000 - 2002). Co-founder of a startup provider of Data Management and Predictive Modeling services sold to Landacorp in 2001. General Manager of the Consulting and Analytics Division of Landacorp, Inc., (a Software and Consulting company focusing on data warehousing, data mining, targeting and prediction for the health insurance industry). Developed Landacorp's first

integrated predictive modeling and care management product with guaranteed savings outcomes provided through reinsurance (first of its kind in U.S.). Led implementations of DM programs for United Healthcare (Chicago), Health Net of Arizona, M-Plan, Lifeguard and Parkview Hospital. Staff managed numbered 15 at peak. Arizona and Chicago implementation included hiring and managing nurse call center staff on behalf of client. Ultimately staff and functions consolidated into another division and the division was closed at end of 2002.

PricewaterhouseCoopers LLP: Director, Management Consulting Services (1996-2000) and Employee Benefits Services (1991-6). Between 1996 and 1999, led the transition of AARP's health insurance businesses (Medicare Supplement and Long-term Care) from Prudential Healthcare to United Healthcare and Metropolitan Life, including vendor identification, program design, contracting and pricing. Led the large scale merger/acquisition project that resulted from AARP's decision to transfer business to UnitedHealthcare (medical) and MetLife (LTC) (approximately \$4.5 billion dollars in premiums and over \$1 billion in reserves). Developed national Medicare Risk network of providers for the Association (subsequently discontinued because of legal liability). After the conclusion of the business transfer, continued to advise AARP in multiple projects including EAP (1999-2003). Sold and implemented enterprise-wide underwriting systems for CIGNA healthcare and Prudential healthcare. Designed and built marketing illustration software for Retiree Medical and Integrated Disability providers (BCBS Association and Metropolitan Life Disability). Led the development of an automated financial planning/projection system for BCBS Michigan. Consulted to large employers and managed care companies in the areas of pricing, product development and reserving, strategic planning and re-engineering of services. Director responsible for the claims audit practice and claims operations efficiency consulting. Other clients include Aetna Life & Casualty, Federal Crop Insurance Program, CIGNA HealthCare, Prudential Insurance, Zurich Centre Re and Harvard Pilgrim Health Care.

Aetna Life and Casualty (1980-1991): Managing Director of the Aetna Benefits Consulting Group (1989-1991), focusing on healthcare data management and value-added consulting to Aetna's large customers. Started the Health Actuarial Consulting Practice (1989) and grew to over \$1 million in revenue with approximately 35 consultants.

Group Life Insurance Product Manager and Group Valuation Actuary (1985-1989).
Aetna Canada: Group Insurance Actuary (1980-5).

AWARDS

Society of Actuaries: President's Award for Pioneering Achievement, 2005.
DMAA: Best published paper on Disease Management, 2003 and 2006.

INDUSTRY GROUPS

SOA representative, International Actuarial Association Health Committee (2016-)
American Academy of Actuaries Big Data Committee (2017 -)
Society of Actuaries: Chairman of the Health Section Committee on External Relations.
Organizer of the Annual External relations seminar for actuaries and health researchers to

discuss topics of joint interest. Founder and organizer of the SOA's Predictive modeling conference (5 years). Instructor, SOA Seminar in Health Predictive Analytics (2016-). Chair: (2006-7), SOA Council on Education and Research. Editor (2002-4): "The Independent Consultant" (newsletter for consulting actuaries). Chair, Smaller Consulting Firm Section, SOA (2004-5). Member, American Academy of Actuaries Health Practice Council; Vice-chair, international committee (2010-7). Chair: American Academy of Actuaries workgroup on wellness and disease management (2003-2010). Adjunct Research Professor, Dept. of Health Administration, Georgetown University, Washington D.C. (2007-13). Principal Investigator, Massachusetts Health Insurance Reform study, funded by the Commonwealth Fund and Society of Actuaries. Research Associate, Harvard Healthcare Delivery Program, Kennedy School of Government at Harvard University (2003-8). Member, Agency for Healthcare Research and Quality, (DHHS) Committee on Economics of Care Management. Member, Quality and Research Committee, Disease Management Association of America. Principal Investigator, Society of Actuaries project to evaluate care management measurement methodologies (2003-6).

BOARD MEMBERSHIPS

Commonwealth of Massachusetts Health Insurance Connector Authority Board (2007-14).

Bryan University (Tempe, AZ). Program in Health Analytics (2012-).

Society of Actuaries Board of Directors (2012-5)

Editorial Board, *Population Health* (2011 -)

Deputy Editor, *North American Actuarial Journal* (2013 -)

PUBLIC PRESENTATIONS

Frequent speaker at actuarial, health industry and other conferences.

PUBLICATIONS

1. Duncan I, Huynh N. "A Predictive Model for re-admissions among Medicare Patients in a California Hospital." Forthcoming: *Population Health Management*, October 2017.
2. Fitzner K, Handmaker K.E. and Duncan I. "Augmented Intelligence: Enhancing the Roles of Health Actuaries and Health Economists for Population Health Management," Forthcoming *Population Health Management*, September 2017.
3. Ian Duncan: Massachusetts Health Insurance Reform: Promise and Results. Impact on Insurance Markets, Pricing, and Profitability. A study sponsored by the Commonwealth Fund and Society of Actuaries. Schaumburg, IL. Society of Actuaries. 2016.
4. Ian Duncan and Stephane Guerrier: "Member Plan Choice and Migration in Response to Changes in Member Premiums after Massachusetts Health Reform." *North American Actuarial Journal*, 20(4), 404-419.
5. Adam Long, Ian Duncan and Roger Reed: "Outcomes across the value chain for a comprehensive employee

- health and wellness intervention: A cohort study by degrees of health engagement.” *Journal of Occupational and Environmental Medicine*. July 2016 Vol. 58 - Issue 7: p 696–706.
6. Duncan Ian. “An Elephant—But Not Just in the Emergency Room.” *Population Health Management*. April 2016, 19(2): 77-77. doi:10.1089/pop.2016.0002.
 7. Ian Duncan, Stephane Guerrier and David Kerr: “Use of a publicly available database to determine the impact of diabetes on length of hospital stay for elective orthopedic procedures in California” *Population Health Management*. Dec 2016, 19(6): 439-444.
 8. Duncan, I, Clark, K.L. and Wang, S. “Cost and Utilization of Retail Clinics vs. Other Providers for Treatment of Pediatric Acute Otitis Media” *Population Health Management* (forthcoming).
 9. Duncan, I, Loginov, M and Ludkovski, M: “Predictive Modeling of Healthcare Costs using Hierarchical Regression” *North American Actuarial Journal* 20(1):1-23 January 2016.
 10. Janeen DuChane, PhD; Bobby Clark, PhD; Francis Staskon, PhD; Rick Miller, RPh, MBA; Kathleen Love, RN; Ian Duncan, FSA, FIA, FCIA, MAAA. “Impact of Managed Therapy on Adherence to Medications Used to Treat Multiple Sclerosis and Related Comorbid Conditions.” *International Journal of MS Care*: March/April 2015, Vol. 17, No. 2, pp. 57-64.
 11. B.L. Clark et al. “Evaluation of a Retrospective Drug Utilization Review Program for the treatment of Plaque Psoriasis: A Pilot Study.” *J. Pharma. Care Health Sys*. 2015 2: 126.
 12. Duncan, I and H. E. Frech III: “Measuring Healthcare Efficiency.” *North American Actuarial Journal* 18(4) 443-4.
 13. Janeen DuChane; Bobby Clark; John Hou; Karen Fitzner; Glen Pietrandoni; Ian Duncan “Impact of HIV-specialized pharmacies on adherence to medications for comorbid conditions” *J Am Pharm Assoc. (2003)* 2014;54:493-501. doi:10.1331/JAPhA.2014.13165
 14. Kirkham, H. S., Clark, B. L., Bolas, C., Lewis G.H., Jackson A., Fisher D. “Which modifiable health risks are associated with changes in productivity costs?” *Population Health Management*, 2015 Feb;18(1):30-8.
 15. Kirkham, H. S., Clark, B. L., Paynter, J., Lewis, G. H., & Duncan, I. (2014). “The effect of a collaborative pharmacist–hospital care transition program on the likelihood of 30-day readmission” *American Journal of Health-System Pharmacy*, 71(9), 739-745. doi: [10.2146/ajhp130457](https://doi.org/10.2146/ajhp130457)
 16. Bobby Clark, Karen Fitzner, Julia Zhu, Michael Einodshofer, Suann Stone, Janeen DuChane, Ian Duncan “Site of Care Optimization for Infusion Therapy” *Am. J. Mgd. Care*.
 17. Kessler, R, Shahly V. and Duncan I. “Worksite Primary Care Clinics: A Systematic Review” *Population Health Management*, 2014 Oct;17(5):306-15.
 18. Clark, B, DuChane J, Hou, J., Rubinstein, E, McMurray, J and Duncan I. “Evaluation of Increased Adherence and Cost Savings of an Employer Value Based Benefits Program Targeting Generic Antihyperlipidemic and Antidiabetic Medications” *J. Mgd. Care Pharmacy*.
 19. *Managing and Evaluating Healthcare Intervention Programs*. 2nd edition. (Actex Publications, January 2014.)
 20. Lewis, GL, Kirkham, HS, Duncan, I and Rhema Vaithianathan: “How Health Systems Could Avert 'Triple Fail' Events That Are Harmful, Are Costly, And Result In Poor Patient Satisfaction.” *Health Affairs*, 32, no.4 (2013):669-676
 21. Irizarry L, Li QE, Duncan I, Thurston AL, Fitzner KA, Edwards BJ, McKoy-Bent JM, Tulas KM, **McKoy JM**. “Effects of Cancer Comorbidity on Disease Management: Making the Case for Diabetes Education (A Report from the SOAR Program).” *Pop. Health Manag.* 2013 Feb;16(1):53-7.
 22. Taitel MS, Duncan IG, “Medication days’ supply, adherence, wastage, and cost among chronic patients in Medicaid.” *Medicare and Medicaid Research Review* 2012 2 (3).
 23. Duncan IG, Taitel MS, Zhang J, Kirkham HS: “Planning influenza vaccination programs: a cost benefit model.” *Cost Effectiveness and Resource Allocation* 2012 10:10.
 24. Khandelwal, N, Duncan, I, Rubinstein, E, Ahmed, T and Pegus, C. “Community Pharmacy and Mail Order Cost and Utilization for 90-Day Maintenance Medication Prescriptions”. *Journal of Managed Care Pharmacy*. April, 2012.
 25. Hou, J, Murphy, P, Tang, A, Khandelwal, N, Duncan, I and Pegus, C. “Impact of an Online Prescription Management Account on Medication Adherence” *American Journal of Managed Care* 2012;18(3):e86-e90.
 26. “Mining Health Claims Data for Assessing Patient Risk” In “Data Mining: Foundations and Intelligent Paradigms” Volume 3: *Medical, Health, Social, Biological and other Applications*. D.E. Holmes and L. Jain (eds.),

Springer Verlag 2012.

27. Taitel M, Cohen, E, Duncan, I, Pegus, C. "Pharmacists as providers: Targeting pneumococcal vaccinations to high risk populations." *Vaccine*. 2011 Oct 19;29(45):8073-6.
28. Khandelwal, N, Duncan, I, Rubinstein, E, Ahmed, T and Pegus, C. "Community Pharmacy and Mail Order Cost and Utilization for 90-Day Maintenance Medication Prescriptions". *Journal of Managed Care Pharmacy*. 2012 Apr;18 (3):247-55.
29. Taitel M, Terranova B, Baloun L, Kirkham H, Duncan I, Pegus C. "Pharmacists as Immunization Providers: Patient Attitudes and Perceptions." *Pharmacy Times*. 2011.
<http://www.pharmacytimes.com/publications/issue/2011/September2011/Pharmacists-as-Immunization-Providers-Patient-Attitudes-and-Perceptions>.
30. Khandelwal N, Duncan I, Rubinstein E, Ahmed T, Pegus C, Murphy P, Kudrak KE. "Medication adherence for 90-day quantities of medication dispensed through retail and mail order pharmacies." *Am J Manag Care*. 2011 Nov 1;17(11):e427-34.
31. Vortherms, J., PharmD, Leonard Fensterheim, MPH, Michael Taitel, PhD, Heather Kirkham, PhD, MPH, Mahesh Raju, PharmD, MPH, Joanna Lalich, PharmD, Ian Duncan, FSA, FIA, FCIA, MAAA. "A Community Pharmacy Diabetes Management Program to Improve Biometric and Cardiac Risk Factors" Poster Presentation at American College of Clinical Pharmacy 2011 Annual Meeting.
32. Patwardhan, A, Duncan, I, Murphy, P, Pegus, C. The Expanded Role and Value of Pharmacists in Health Care. *Population Health Management*. June 2012, 15(3): 157-162. doi:10.1089/pop.2011.0030.
33. Khandelwal N, Duncan I, Ahmed T et al. Oral Chemotherapy Program Improves Adherence and Reduces Wastage and Hospital Admissions. *Journal of National Comprehensive Cancer Network*. 2012;10:618-625.
34. Ian Duncan, FSA FIA FCIA MAAA, et al. "Assessing the Value of the Diabetes Educator" *The Diabetes Educator* 37(5) September-October 2011 638-657.
35. Khandelwal, N, Duncan I, et al "Medication Adherence for 90-day Quantities of Medication dispensed through Retail and Mail-order pharmacies." *Am J Manag Care*. 2011; 17 (5 Spec No.):e169-e173.
36. Day, Brian, Ed. D., Ian Duncan, FSA FIA FCIA MAAA, and Brian Beatty, MS "A Risk-Based Evaluation Methodology for Cost Effectiveness of Chronic Condition Health Management Programs" *North American Actuarial Journal* 2011 15 (1).
37. "Managing and Measuring Care Management Intervention Programs" in J. Rosenbloom (ed). *Handbook of Employee Benefits* (7th ed). McGraw-Hill (2011).
38. Khandelwal N, Duncan I, Ahmed T et al. "Impact of Clinical Oral Chemotherapy Program on Wastage and Hospitalizations." *Am J Manag Care*. 2011; 17 (5 Spec No.):e169-e173
39. Khandelwal N, Duncan I, Ahmed T et al "Impact of Clinical Oral Chemotherapy Program on Wastage and Hospitalizations." *Journal of Oncology Practice*. 2011; 7 (3S):e25s-e29s
40. Taitel M, Duncan I, Meaux N, Pegus C, Valerian C, Kirkham H. "Place of death among terminal heart failure patients in a continuous inotropic infusion program." *American Journal of Hospice and Palliative Medicine*.
41. "Effects of a Pregnancy Management Program On Birth Outcomes in Managed Medicaid" Mason, M, Poole-Yeager, A, Lucas B, Krueger, C, Ahmed T, Duncan I. *Managed Care* April 2011.
42. *Healthcare Predictive Modeling and Risk Adjustment* Actex Publications (2011).
43. Rosenberg, M, Johnson, P.H. Jr. and Duncan, I "Exploring Stakeholder Perspectives on What Is Affordable Health Care" *Risk Management and Insurance Review*; published online, November 2009.
44. Ian Duncan, FSA FIA FCIA MAAA, et al. "Assessing the Value of Diabetes Education" *The Diabetes Educator* 35(5) September-October 2009 752-760.
45. Birkmeyer, C and Duncan I: "Health plans tackle DM. Software innovations enable health plans to structure results-driven disease-management programs and demonstrate true ROI." *Health Management Technology*. 2009 Jun;30(6): 22, 24.
46. Messer, T, Farah, J.R., Duncan I, Kamali, K, Harner, J. "Random Fluctuations and Validity in Measuring Disease Management Effectiveness for Small Populations" *Population Health Management* December 2008.
47. *Managing and Evaluating Healthcare Intervention Programs*. (1st Edition) Actex Publications, 2008.
48. Duncan I, Lodh, M, Berg, G, and Mattingly, D "Understanding Patient Risk and its Impact on Chronic and Non-Chronic Member Trends." *Population Health Management*, October 2008.
49. Duncan I (Editor): *Dictionary of Disease Management Terminology*. DMAA, (First edition, 2004. Second

- edition 2006). A comprehensive guide to the processes, definitions, and terminology used in this area of Managed Care.
50. Duncan I, Bachler R and Juster I. "A Comparative Analysis of Chronic and Non-Chronic Insured Commercial Member Cost Trends" *North American Actuarial Journal* 10 (4) October 2006. Winner of the DMAA prize for best published article in 2006.
 51. Duncan I. "Care And Disease Management: An Actuarial Response". *Benefits & Compensation Digest*, 42 (8) August 2005.
 52. Duncan I. "Accuracy in the assessment of return on investment of defined population interventions." *Joint Commission journal on quality and patient safety. Joint Commission Resources*.2005 Jun;31(6): 357; author reply 358.
 53. Author, Society of Actuaries Part 8 Examination Study Note on Care Management evaluation.
 54. "Population Risk Management: Reducing Costs and Managing Risk in Health Insurance." (with Arthur Robb, Ph. D.) in Arnold Shapiro, *ed* : "Intelligent and other Computational Techniques in the Insurance Industry." (World Scientific, December 2003).
 55. "Measurement of ROI/Effectiveness of Medical Management Processes". Record, Society of Actuaries, Volume 30, (1). <http://library.soa.org/library-pdf/rsa04v30n1111of.pdf>
 56. "Evaluating the Results of Care Management Interventions: Comparative Analysis of Different Outcomes Measures" by Henry Dove, Ph.D. and Ian Duncan, FSA, MAAA. Research sponsored by the Society of Actuaries Health Section. Available at : <http://www.soa.org/ccm/content/?categoryID=327001>
 57. "Its time for the industry to move on from ROI", *Disease Management*, (Vol. 7 (3) October, 2004).
 58. "New Strategies in Disease and Utilization Management: Substituting Facts for Assumptions" Record, Society of Actuaries, 29(2) June 2003.
 59. Duncan I, Dove H and Robb, A. "A prediction model for targeting low-cost, high-risk members of managed care organizations" *Am. J. Mgd. Care*, May 2003. (Winner of the DMAA Prize for the best published article in 2003).
 60. "Population Risk Management", Health Section News, Society of Actuaries. June, 2002.
 61. "Measuring the Total Cost of Lost Time" (with Jonathon Crane, Ph. D.) in Janet R. Douglas: *Managing Workers' Compensation*. John Wiley, 1996.
 62. "Benchmarking and Cost Control" in Janet R. Douglas: *Managing Workers' Compensation*. John Wiley, 1994.