

The Geographic Spread of Infectious Diseases

PRINCETON SERIES IN THEORETICAL AND COMPUTATIONAL
BIOLOGY

Series Editor, Simon A. Levin

The Geographic Spread of Infectious Diseases: Models and Applications, by Lisa Sattenspiel with contributions from Alun Lloyd

Theories of Population Variation in Genes and Genomes, by Freddy Bugge Christiansen

Analysis of Evolutionary Processes, by Fabio Dercole and Sergio Rinaldi

Mathematics in Population Biology, by Horst R. Thieme

Individual-based Modeling and Ecology, by Volker Grimm and Steven F. Railsback

The Geographic Spread of Infectious Diseases

Models and Applications

Lisa Sattenspiel

with contributions from Alun Lloyd

PRINCETON UNIVERSITY PRESS
PRINCETON AND OXFORD

Copyright © 2009 by Princeton University Press

Published by Princeton University Press
41 William Street, Princeton, New Jersey 08540

In the United Kingdom: Princeton University Press
6 Oxford Street, Woodstock, Oxfordshire OX20 1TW

All Rights Reserved

Library of Congress Cataloging-in-Publication Data

Sattenspiel, Lisa.

The geographic spread of infectious diseases : models and applications
/ Lisa Sattenspiel with contributions from Alun Lloyd.

p. cm. (Princeton series in theoretical and computational biology)

Includes bibliographical references and index.

ISBN 978-0-691-12132-1 (hardcover : alk. paper) 1. Communicable diseases—Epidemiology—Mathematical models. I. Lloyd, Alun, 1970- II. Title. III. Series.

[DNLM: 1. Communicable Diseases—epidemiology. 2. Communicable Diseases transmission. 3. Disease Outbreaks—statistics & numerical data. 4. Epidemiologic Methods. 5. Models, Theoretical. WA 110 S253g 2009]

RA643.S39 2009

614.401'5118—dc22

2008038171

British Library Cataloging-in-Publication Data is available

This book has been composed in L^AT_EX

The publisher would like to acknowledge the authors of this volume for providing the camera-ready copy from which this book was printed.

Printed on acid-free paper. ∞

press.princeton.edu

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

*Dedicated to Steven, Matthew, Elisabeth, and Stephanie who make
my life a constant joy and to Franki and Ed (in spirit) who
ultimately made this all possible. Love always — Lisa*

The formidable task of developing models for endemic disease may be compared to building a house in a hurry. Practical workers insist on building a complete house, and are not too worried that it may need replacing later. Theoreticians insist on building reliable foundations and are not too worried if the house is never finished. Both points of view have their merits, and ideally we need to combine these.

— Mollison and Kuulasmaa, *Spatial Epidemic Models*