

Population nutrition in Iraq districts modeled from international data

Ronald Calitri

Presentation for, “R” Statistical Programming
Meetup, New York, NY, 9/2/2010

- calitrir@earthlink.net

“A Country Marches on Its Stomach”

- The only previous use of this phrase (on the internet) is, “A country marches on its stomach, and wins by the last pound of wheat or the last pound of meat.” Walsh, Frank P., in testimony, U.S. Senate, Committee on Foreign Relations, “Treaty of Peace with Germany,” Government Printing Office, Washington, D.C., 1919, p.797.
- Problem: The literature reports that comprehensive data needed to profile Iraq’s population nutrition in spatial detail were collected in many surveys 1990-2007. No comprehensive nutrition report for Iraq, ever, has been located. The dogs never barked.
- Emergency missions often report malnutrition rates among children 0-5, and at times refer to them as nutrition surveys. Nutrient intakes of several dozen components are needed. Population nutrition is the least well-served branch of economic development; and dietary surveys required for its study are rarely undertaken.
- How curious, in all this war, we never target the enemy’s quartermaster, or concern ourselves much with our friends’.

The World Food Summit (WFS, 1996)

“model”

- Builds upon goal set by World Food Conference (1974), in, “Universal Declaration on the Eradication of Hunger and Malnutrition, “ ... that within a decade no child will go to bed hungry, that no family will fear for its next day’s bread, and that no human being’s future and capacities will be stunted by malnutrition,”
- WFS background paper (FAO, “Assessment of feasible progress in food security,” 1996), defined dietary adequacy as a population distribution where, “practically no one is left with food intake below adequate levels.”
- The WFS imperative to assess dietary distributions reflected a decadal consensus among population nutritionists. Beaton, G.H., “Human requirement estimates,” Food, Nutrition and Agriculture, No.2/3, 1991:
- “If only per caput nutrient intake can be estimated (i.e. if distribution of intakes among population strata, and among individuals within strata, is not known), there is no fully validated approach to assessment. Approaches that do exist or that are evolving depend upon assumptions about the distribution of intakes.”

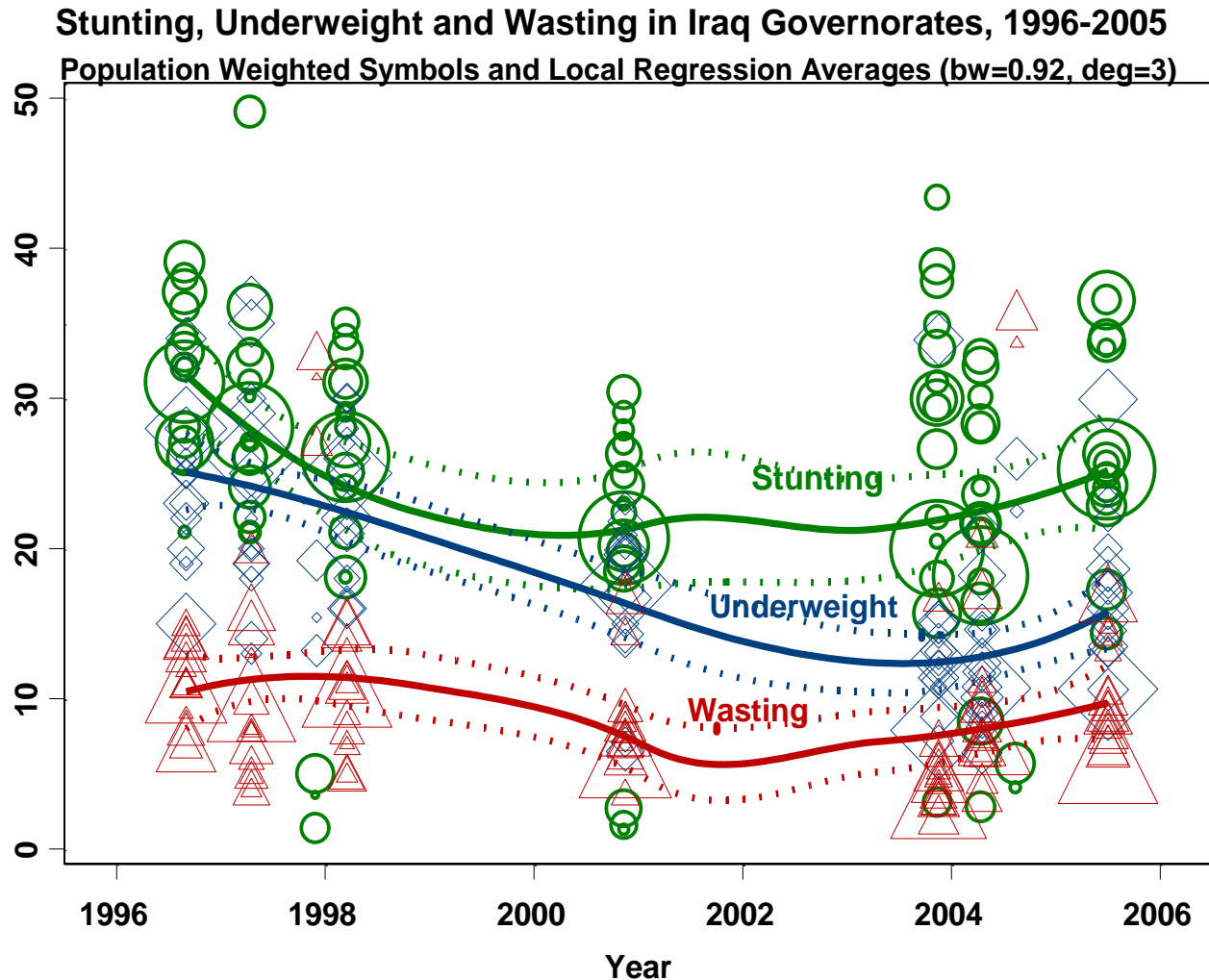
Oil-For-Food Guidelines ignore WFS model

- In 1998, U.N. Secretary General set a calorie target: 2,463 kcal/cap/dy for Iraq food distributions, under Oil for Food Program (OFFP).
- WFS (1996), in countries with “mild” inequality in dietary distribution, to achieve adequacy, suggested 2,700 kcal (2,600–2,950) be available, on average. In cases of “moderate” inequality, the target would have to be raised to 3,100-3,300 kcal, and would increase well above 3,300 [$>3,450$] for the most unequal countries. Under the WFS methodology, the S.G.’s target assumed an almost flat dietary distribution resulting from a flat income distribution.
- The S.G.’s protein and fat targets were also adequate only assuming a flat dietary distribution.
- Iraq Public Distribution System (PDS), 1991 – date. Monthly distributions. U.N. promised monitoring of PDS operations under OFFP, “Memorandum of Understanding” (MOU, 1996): *“Observation of the equitable distribution of humanitarian supplies and determination of their adequacy. ... confirm whether the equitable distribution of humanitarian supplies to the Iraqi population throughout the country has been ensured; ... ensure the effectiveness of the operation and determine the adequacy of the available resources to meet Iraq's humanitarian needs.”*
- Abuses in system were widely reported, political exclusions, extras for military. UN agencies did not report systematically, sequestered survey data. By 2002, Office of the Iraq Programme reported, “All households in the center/south received their food ration on time and regularly.”
- UN Independent Inquiry Committee, (IIC) established 2004, charged to investigate MOU, instead, reported, 2005, on diversions of oil sales receipts and kickbacks on food purchase contracts rather than distributions within the country. I met with committee members Volcker, Goldstone, and staff, 7/2004, reporting calculations from WFP/FAO 2003 emergency mission report, about 40 percent of food by value was diverted from PDS into private sales and exports. The IIC appointed “Independent Working Group,” in part previously suborned, continued cover-up of diversions. The title of the 2006 IIC book, “Good Intentions Corrupted,” (Meyer, Califano, Volcker), seems an appropriate epithet.
- Diversions from the PDS, if anything, appear to have worsened since 2003

“Other Means” are Necessary

- The WFS model can be sketched using national average energy, protein and fat availabilities (EPF), published annually in FAO food balance sheets, with WB or UNIDO estimates of income and distribution. See last page for an example.
- But, Iraq’s data vanished from FAOSTAT, after detailed agricultural production results for 2002 were accessed 9/2003. Chief, Basic Data Branch, Statistics Division, FAO, e-mail, 11/11/2003: “The reliability of the data reached a low point where we have decided in the Statistics Division not to show it.”
- From 2003 to date, no food balance sheets for Iraq, or, for that matter, Afghanistan, have been published.
- What is to be Done?
- A food balance sheet for Iraq, c.2002, was constructed, from FAO data, literature, and OFFP contracts compiled by the IIC. Results from this FBS were, 2,442 kcal Energy, 60.7g Proteins, and 52.7g Fats.
- What can be used to confirm this estimate? Despite data sequestrations, one measure consistently reported out of Iraq, from 1991-2007, and likely forward, is child malnutrition. Stunting, Underweight, and Wasting (SUW) among persons aged 0-5, national averages, were located for 131 countries, 1966-2004, possessing FAO EPF availability estimates, and UN system per capita income and Gini coefficients of income distribution.
- This, we study here against 95 districts in WFP survey, 2003, and will repeat for 2005 and 2007 WFP surveys. First, here is a longer time series for Governorates.

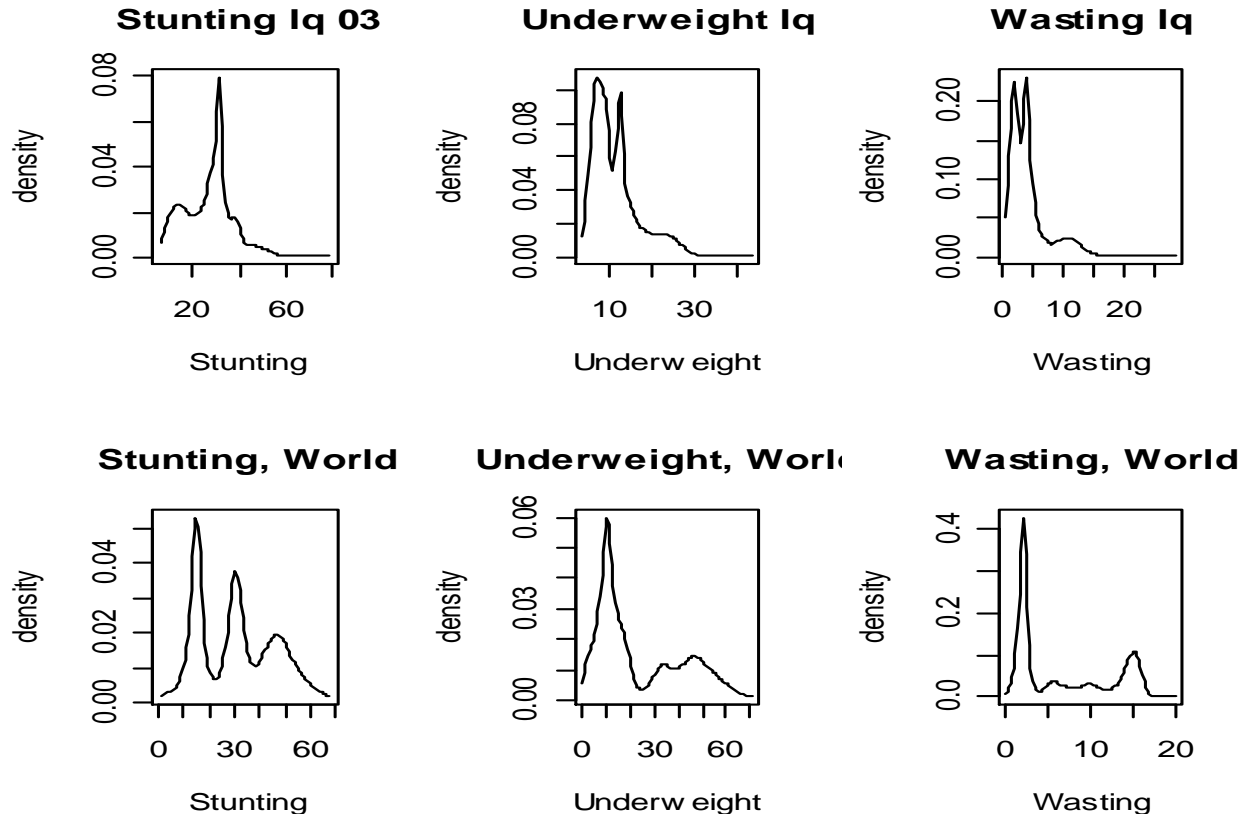
Using “Locfit,” an older version for S+



Note that 2007 results are not yet entered. Curve flattens slightly. With regard to population malnutrition (children+adults) research (against 19 countries thus far) suggests that child malnutrition is not a biased estimator.

S, U, W Densities, Iraq 2003, World 1966-2004

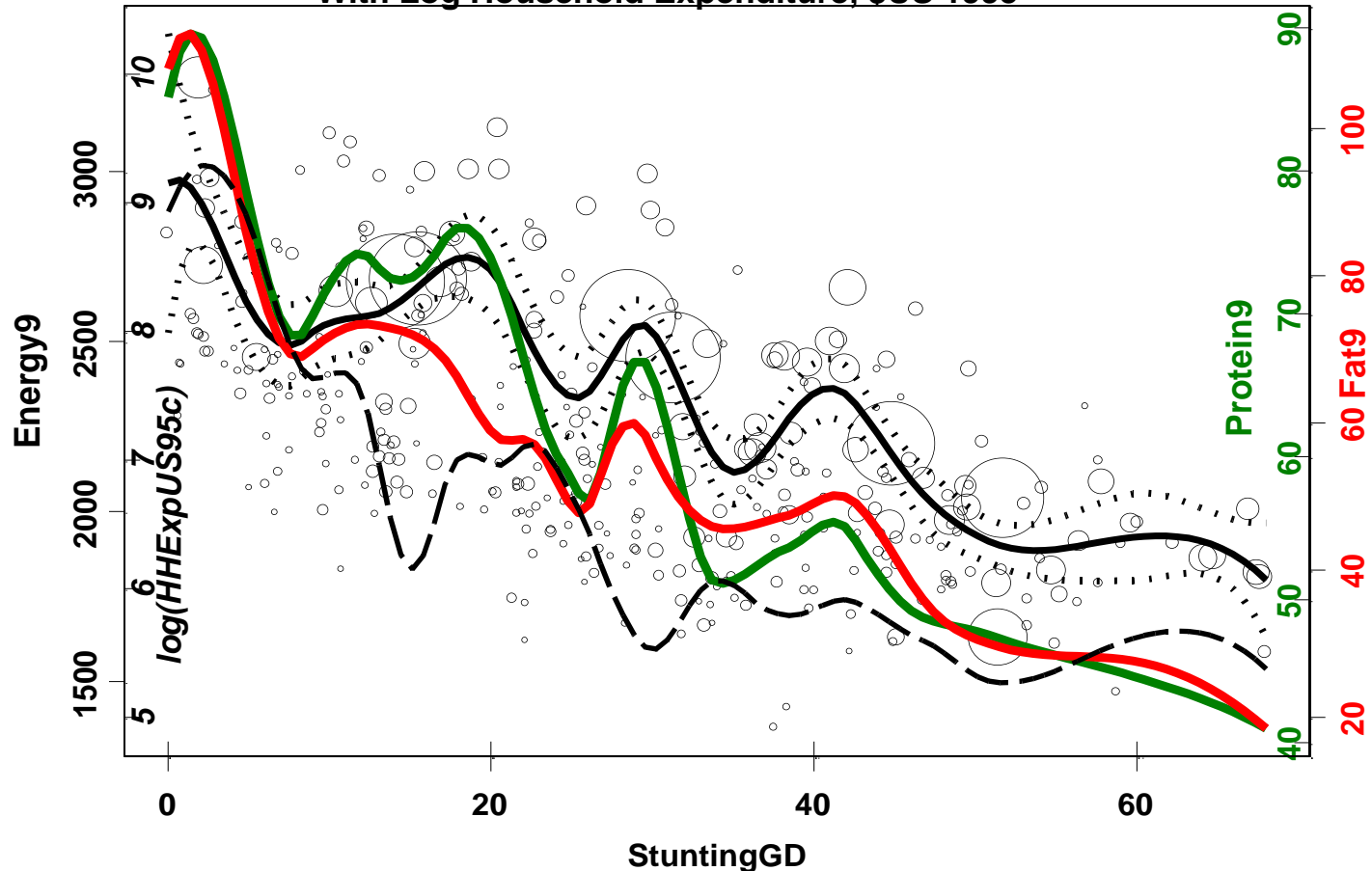
“R” (par mfrow=c(3,2))



`fit<-locfit(~Wasting, data=WORLDSUW,weights=Population,deg=3,alpha=.4),`
etc. Bandwidth 0.4 was minimum to resolve World Wasting; so all variables are shown at that resolution. (?) Note World Underweight ~10% is in line with Iraq.

Measures – World data

EPF by Stunting, Global, 358 Obs, 1966-2002
With Log Household Expenditure, \$US 1995

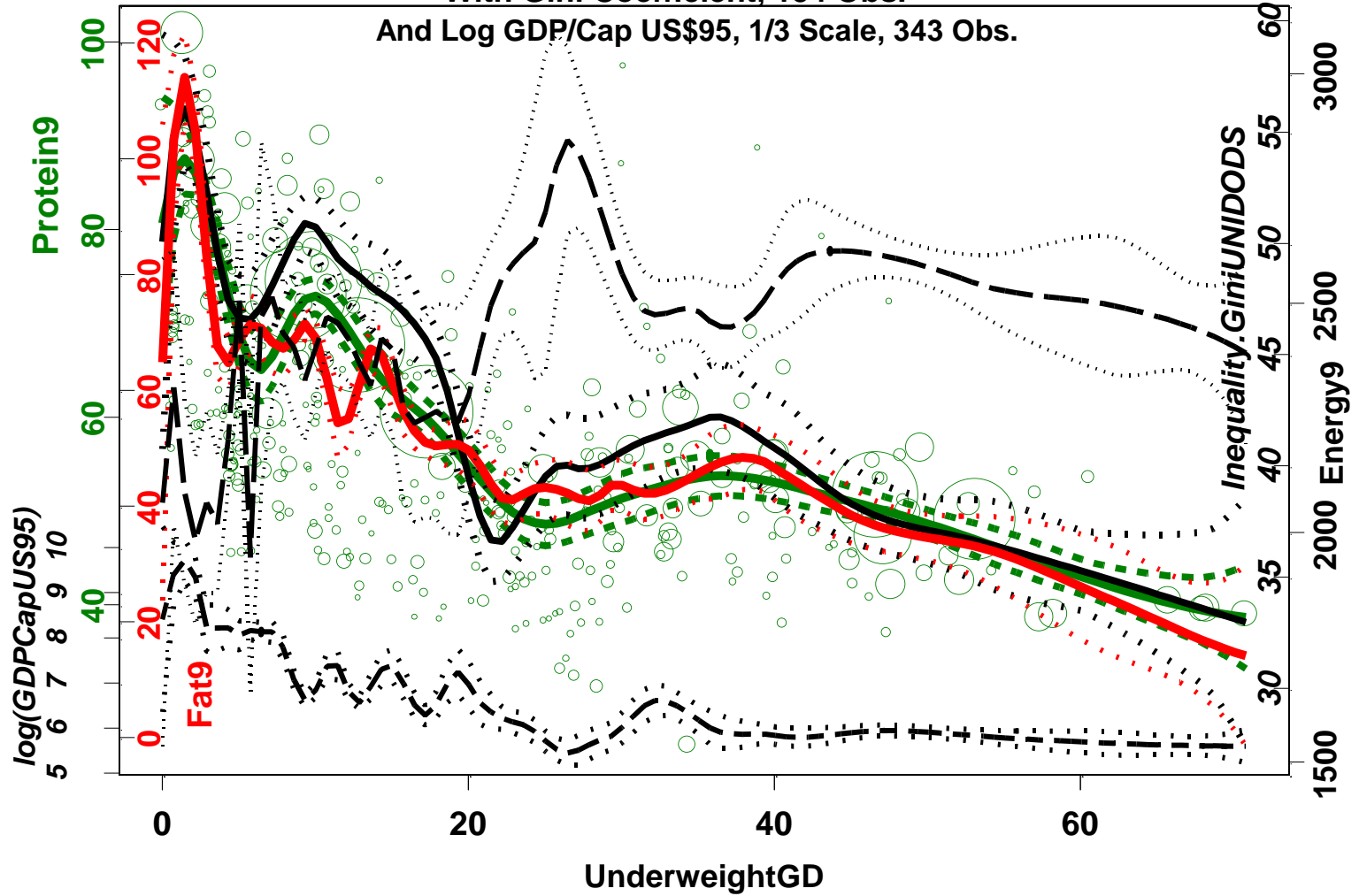


Three figures now display the world data for our experiments. Energy9, Protein9 and Fat9, are 90 percent of FAO availabilities, a rule of thumb for wastage, so Jordan's 3015 kcal in the 2007 FBS measures as 2714. Available income and income distribution variables, all clearly correlated with EPF. All seasonal, as food shortages fail to meet nutrient requirements during growth episodes.

EPF by Underweight, Global, 358 Obs., 1966-2002

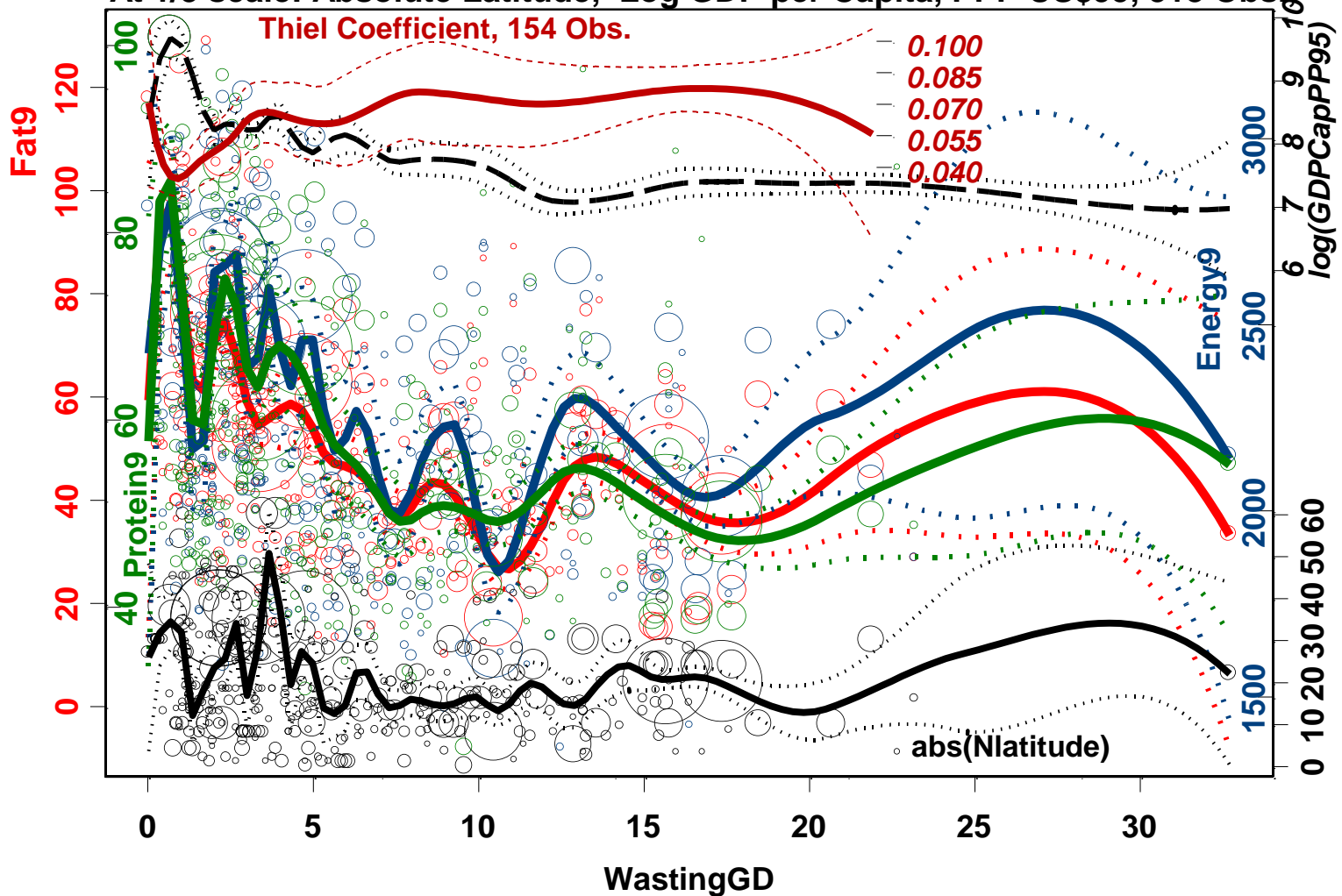
With Gini Coefficient, 154 Obs.

And Log GDP/Cap US\$95, 1/3 Scale, 343 Obs.



EPF by Wasting, Global, 358 Obs., 1966-2002

At 1/3 scale: Absolute Latitude, Log GDP per Capita, PPP US\$95, 318 Obs.

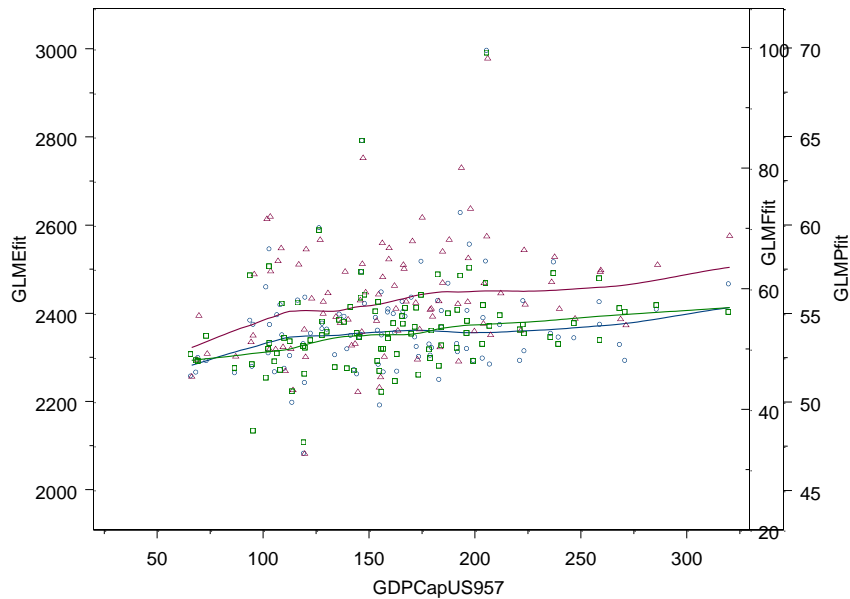


Here, it is necessary to acknowledge that the WFS “model” may leave out other determinants of nutritional status, such as climate, represented by Absolute Latitude.

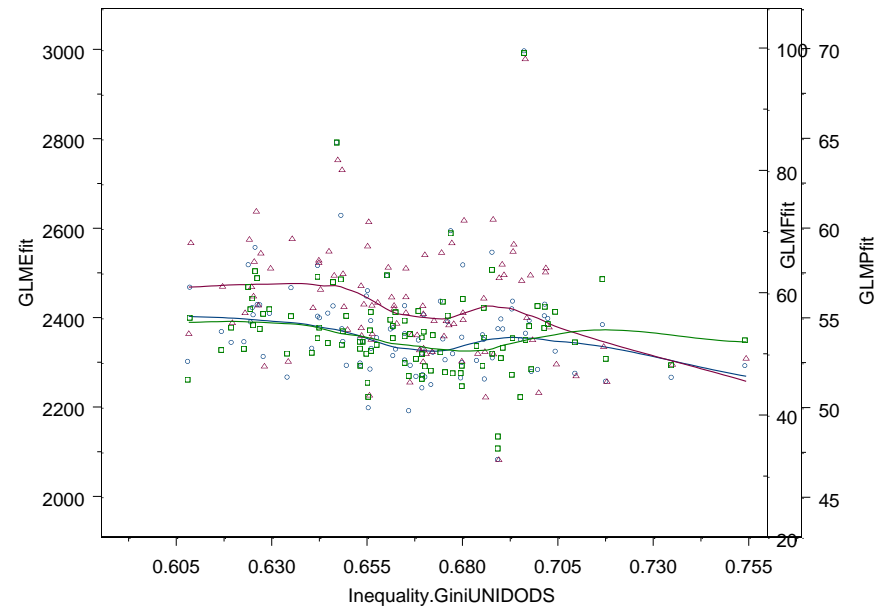
Current State of Research

- Nutritional Status was estimated for 2003 Iraq using EPF projected from world SUW, income and income distribution to 95 Iraq districts surveyed by WFP/COSIT (12/2003). (predict.locfit, se.fit). OLS, Lowess, Robust, Locfit, a variety of methods with standard errors projected.
- Best projected standard errors of approximately 14 percent were achieved using GLM. For example: $\text{Energy9} \sim \text{StuntingGD} + \text{UnderweightGD} + \text{WastingGD} + \text{GDPCapPP95} + \text{GDPCapPP95}^2 + \text{Inequality.GiniUNIDODS} + \text{Nlatitude} + \text{Nlatitude}^2 + \text{Elongitude} + \text{Elongitude}^2$.
- Limitations in compatibility of Locfit and S+ prevented more advanced code from running, so fruitful local regression estimates from global data have been deferred to present.
- Further multivariate research on this topic will make fuller use of locfit “R” version.
- Pending an attempt to model within, “sp” using “locfit,” Spatial stats are used only for within-country interpolations of fitted estimates.

Estimated Energy, Protein and Fats Consumption by Income/Cap, Iraq Districts, 2003

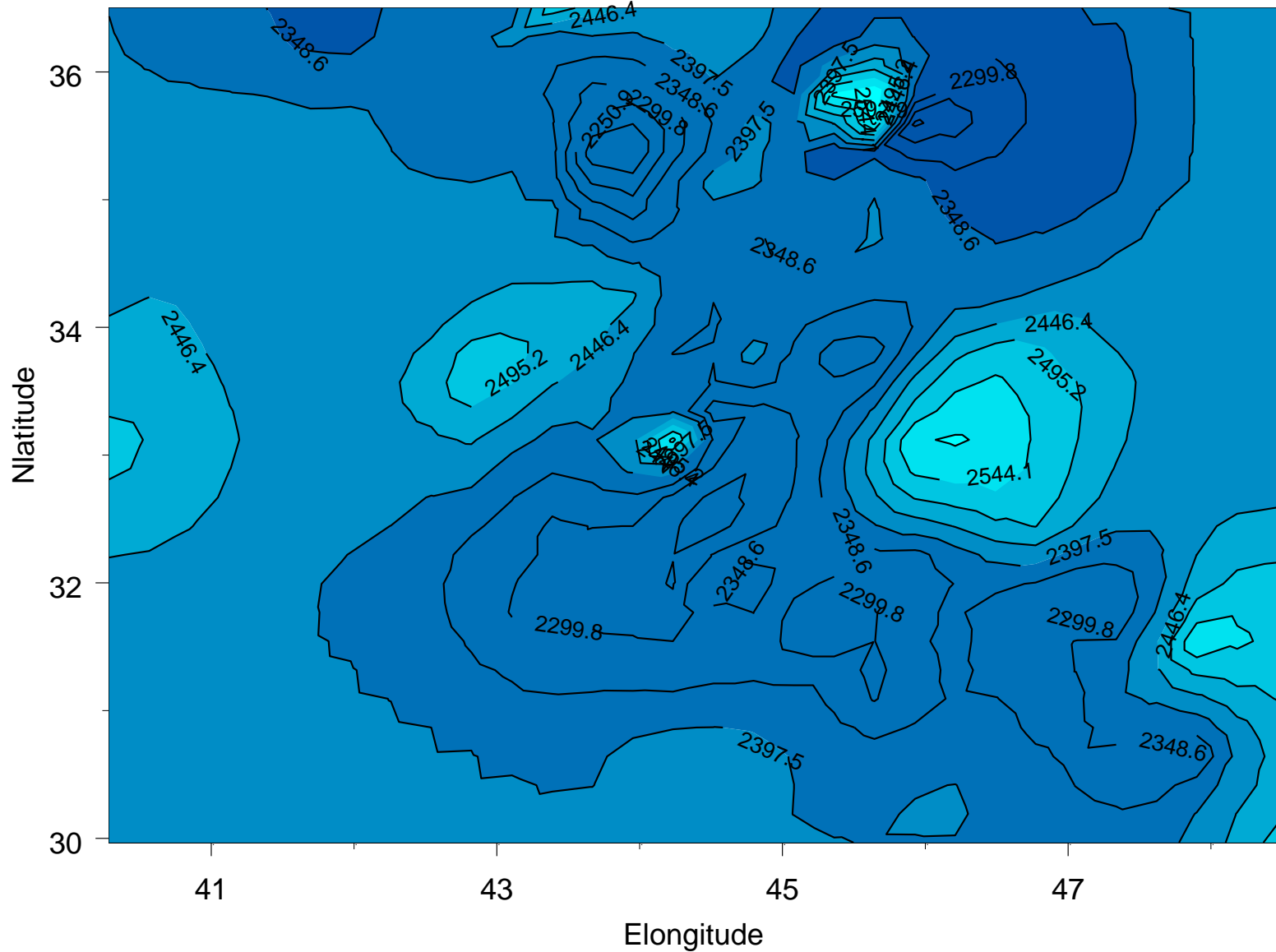


Estimated Energy, Protein and Fats Consumption, by Income Inequality, Iraq Districts, 2003

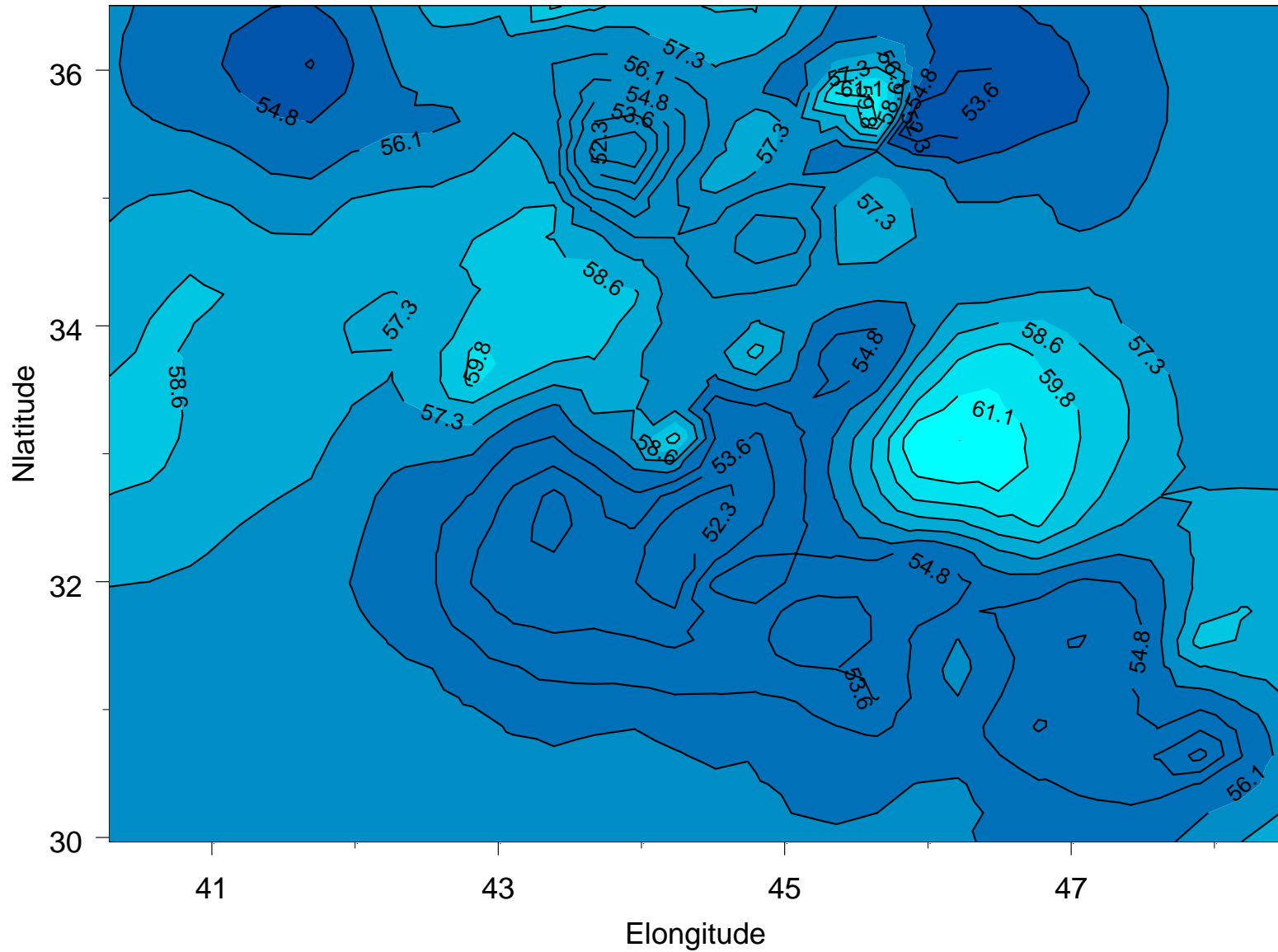


- Here, the estimated EPF values are scattered across income and inequality, and means fit using Locfit. As anticipated, EPF increases with income and diminishes with inequality.
- It is also evident that these estimates, if accurate, are influenced by some other things than income and its distribution.
- So, what about spatial variation?
- Boundary effects precluded effective imaging using Locfit.
- It was simpler to employ universal kriging, using SpatialStats in S+ for the following output. That appears ably improved in the “R” “sp” package (Bivand, Pebesma, Gómez-Rubio, “Applied Spatial Data Analysis with R,” Springer, 2008.

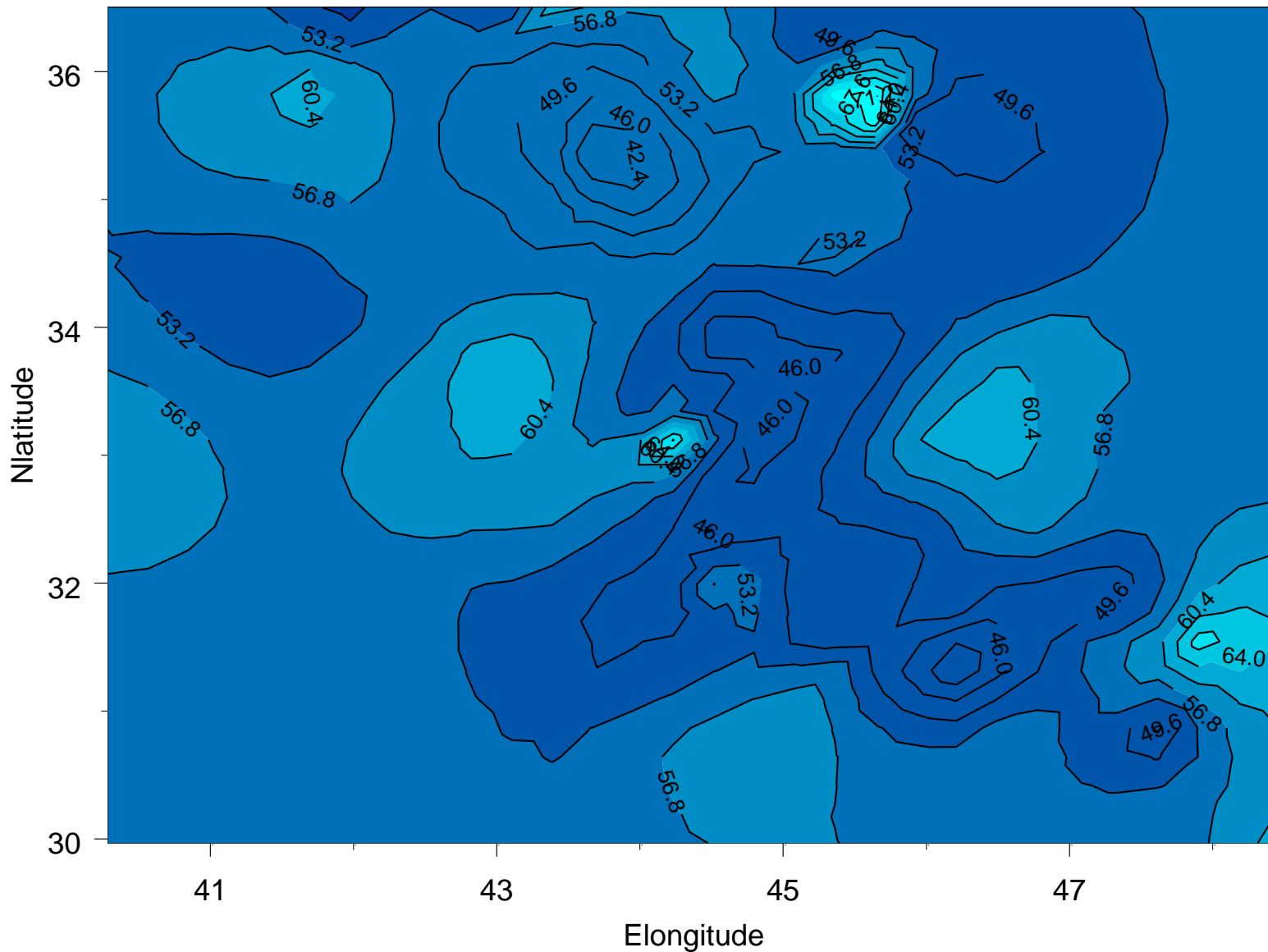
Available Energy estimated from Global S, U, W, Income and Income Distribution, Iraq, 2003



Estimated Protein Availabilities, Iraq Districts, 2003



Estimated Fat Availabilities, 95 Districts, Iraq, 2003



Discussion, Conclusions and Questions.

- The weighted means (16 gov) estimates from international data were 2,357 kcal Energy, 55.7g Proteins and 52.8g Fats. Our independent FBS estimates were, 2,442 kcal Energy, 60.7g Proteins, and 52.7g Fats.
- The clear spatial patterns in Estimated E, P, and F availability in 2003 Iraq suggest some of the material concomitants of inequitable distribution of power, income and wealth during sanctions, with Baghdad and the South in particularly poor condition.
- The nutritional “sweet spot” at upper right of the maps is Suleymaniah, whose nutritional distributions were under more direct U.N. observation.
- Research estimates that OFFP wheat and sugar were re-exported through neighboring countries; and close to half of Iraq’s date harvest was also exported. There were also imports of processed foods and drinks.
- Contracts under OFFP remained the source of PDS foods in 12/2003, when the WFP survey was conducted. The estimated heights in the spatial patterns of Energy and Proteins across Anbar and Suleymaniah straddle the reported wheat and sugar export routes.
- It will be interesting to see what World EPF, income, and SUW, will say about EPF in Iraq, based on income and SUW, in 2005 and 2007 districts.

- Since dietary surveys are rarely undertaken in areas experiencing crises, the described method (world in miniature) may provide information needed to advance population nutrition in crisis areas.
- Remember, it is not just the kids, “Studies in Ethiopia and in India also show very low levels of physical activity in adult men with BMI 18-19 and women with BMI 17-18: work output is sustained at only 2-4.5 hours per day, ... work at low BMI is slower and increases stress in percent of maximal oxygen capacity (VO2Max).” (WHO, “Physical Status: The use and interpretation of anthropometry,” Technical Report Series 854, Geneva, 1995, pp 347-350).
- In progress (competition between FAO, for 14 years, and me, for a few): estimation of nutrients (beyond EPF) from food balance sheet availabilities (species by weight).
- Hopefully, participants at the meeting will have modeling suggestions using “sp,” “locfit,” and other R packages to improve method and output.
- Thank You,
- calitrir@earthlink.net

Jordan - 2007

element																														
country	item	Total Population - Both sexes (1000)	Production (1000 tonnes)	Import Quantity (1000 tonnes)	Stock Variation (1000 tonnes)	Export Quantity (1000 tonnes)	Domestic supply quantity (1000 tonnes)	Feed (1000 tonnes)	Seed (1000 tonnes)	Processing (1000 tonnes)	Other Util (1000 tonnes)	Food (1000 tonnes)	Food supply quantity (kg/capita/yr)	Food supply (kcal/capita/day)	Protein supply quantity (g/capita/day)	Fat supply quantity (g/capita/day)														
	Population	5941																												
	Grand Total + (Total)													3015	Fc	78.20	Fc	90.70	Fc											
	Vegetal Products + (Total)													2631	Fc	50.90	Fc	64.70	Fc											
	Animal Products + (Total)													384	Fc	27.40	Fc	26.00	Fc											
	Cereals - Excluding Beer + (Total)		50	A	2610	A	-280	A	36	A	2344	A	1277	A	6	A	1	A	100	A	970	A	163.30	Fc	1409	Fc	39.50	Fc	7.10	Fc
	Wheat		21	S	1108	S	-280	S	30	S	819	S			2	S	0	S	25	S	802	S	135.00	Fc	1129	Fc	34.00	Fc	6.60	Fc
	Rice (Milled Equivalent)				159	S	0	S	3	S	156	S	0	S					6	S	150	S	25.30	Fc	257	Fc	4.90	Fc	0.50	Fc
	Barley		13	S	804	S	0	S	0	S	817	S	769	S	4	S	1	S	42	S	1	S	0.20	Fc	2	Fc	0.10	Fc	0.00	Fc
	Maize		15	S	533	S			2	S	546	S	507	S	0	S			28	S	11	S	1.90	Fc	16	Fc	0.40	Fc	0.10	Fc
	Rye				0	S					0	S	0	S							0	S	0.00	Fc	0	Fc	0.00	Fc	0.00	Fc
	Oats				0	S					0	S									0	S	0.00	Fc	0	Fc	0.00	Fc	0.00	Fc
	Millet		0	S	0	S					0	S	0	S																
	Sorghum		1	S	0	S			0	S	1	S	1	S	0	S			0	S										
	Cereals, Other				5	S	0	S	0	S	5	S	0	S							5	S	0.80	Fc	5	Fc	0.10	Fc	0.00	Fc
	Starchy Roots + (Total)		97	A	76	A	0	A	28	A	145	A			15	A	13	A	22	A	95	A	16.00	Fc	31	Fc	0.50	Fc	0.10	Fc
	Cassava				1	S			0	S	1	S							1	S										
	Potatoes		97	S	74	S	0	S	28	S	143	S			15	S	13	S	22	S	93	S	15.70	Fc	30	Fc	0.50	Fc	0.10	Fc
	Sweet Potatoes				2	S			0	S	2	S									2	S	0.30	Fc	1	Fc	0.00	Fc	0.00	Fc
	Yams																													
	Roots, Other				0	S			0	S	0	S									0	S	0.00	Fc	0	Fc	0.00	Fc		
	Sugarcrops + (Total)				0	A			0	A	0	A	0	A							0	A	0.00	Fc	0	Fc				
	Sugar Cane				0	S			0	S	0	S									0	S	0.00	Fc	0	Fc				
	Sugar Beet				0	S			0	S	0	S	0	S																
	Sugar & Sweeteners + (Total)		0	A	320	A	1	A	35	A	285	A									285	A	48.10	Fc	470	Fc	0.00	Fc		
	Sugar, Non-Centrifugal																													
	Sugar (Raw Equivalent)				315	S	1	S	35	S	280	S									280	S	47.10	Fc	461	Fc				